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FOOD PROTECTION TRENDS

SCIENCE AND NEWS FROM THE INTERNATIONAL ASSOCIATION FOR FOOD PROTECTION

MAY 2006

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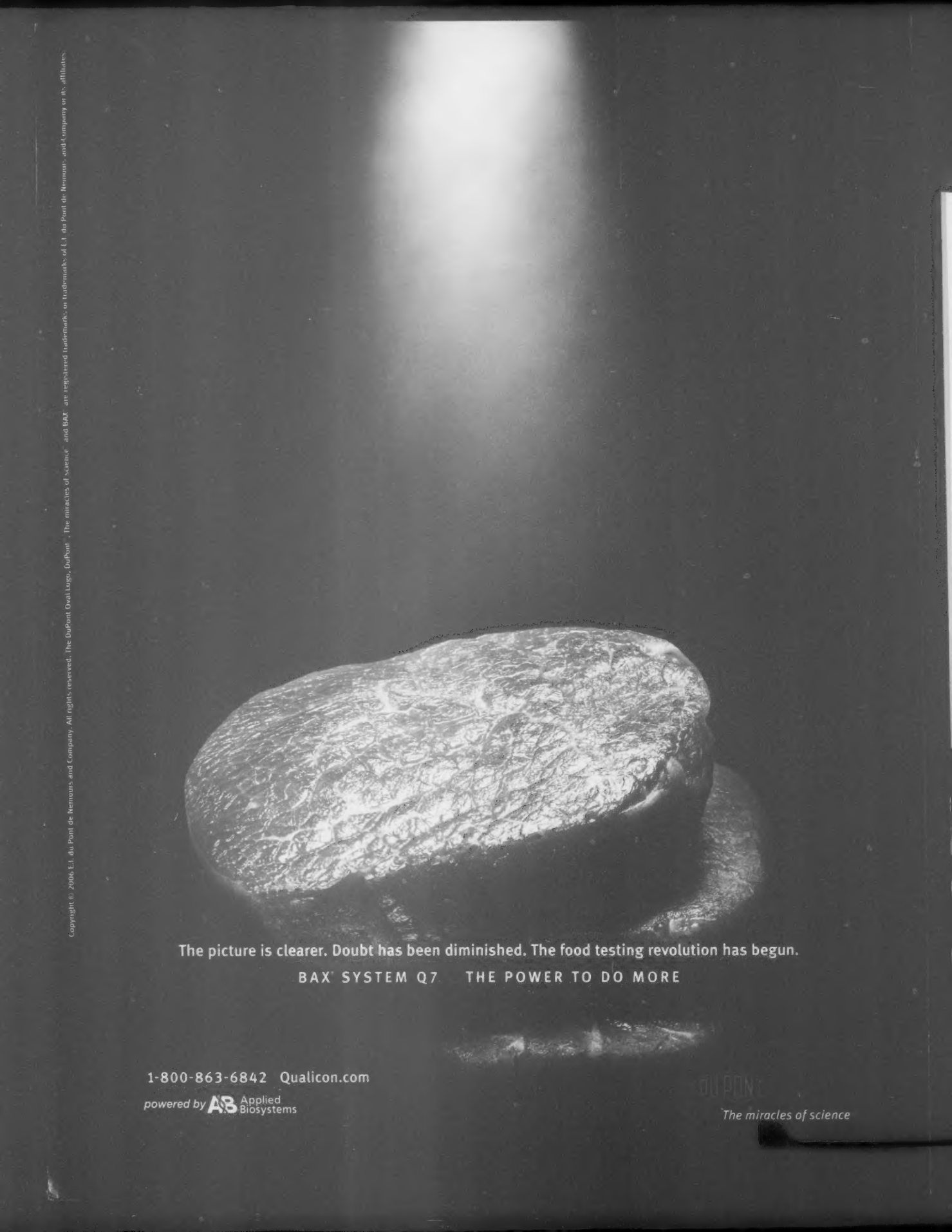
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FOOD PROTECTION TRENDS

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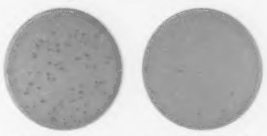

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Phone: 800.369.6337 • 515.276.3344
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Web site: www.foodprotection.org

FPT JOURNAL STAFF

David W. Tharp, CAE: *Executive Director*
E-mail: dtharp@foodprotection.org

Lisa K. Hovey, CAE: *Managing Editor*
E-mail: lhovey@foodprotection.org

Donna A. Bahun: *Production Editor*
E-mail: dbahun@foodprotection.org

Pam J. Wanninger: *Proofreader*

INTERNATIONAL ASSOCIATION FOR FOOD PROTECTION STAFF

David W. Tharp, CAE: *Executive Director*
E-mail: dtharp@foodprotection.org

Lisa K. Hovey, CAE: *Assistant Director*
E-mail: lhovey@foodprotection.org

Donna A. Bahun: *Design and Layout*
E-mail: dbahun@foodprotection.org

Farrah L. Benge: *Accounting Assistant*
E-mail: fbenge@foodprotection.org

Julie A. Cattanach: *Membership Services*
E-mail: jcattanach@foodprotection.org

Tamara P. Ford: *Communications Coordinator*
E-mail: tford@foodprotection.org

Donna Gronstal: *Senior Accountant*
E-mail: dgronstal@foodprotection.org

Nancy Herselius, CMP: *Association Services*
E-mail: nherselius@foodprotection.org

Karla K. Jordan: *Order Processing*
E-mail: kjordan@foodprotection.org

Didi Loynachan: *Administrative Assistant*
E-mail: dloynachan@foodprotection.org

Pam J. Wanninger: *Proofreader*

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Fax: 515.440.2809
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EXECUTIVE DIRECTOR

David W. Tharp, CAE, 6200 Aurora Ave., Suite 200W, Des Moines, IA 50322-2864, USA; Phone: 515.276.3344; E-mail: dtharp@foodprotection.org

SCIENTIFIC EDITOR

Edmund A. Zottola, Ph.D., 2866 Vermilion Dr., Cook, MN 55723-8835, USA; Phone: 218.666.0272; E-mail: lansibay@cpinternet.com

SCIENTIFIC NEWS EDITOR

Doug Powell, Ph.D., University of Guelph, Guelph, Ontario N1G 2W1 Canada; Phone: 519.821.1799; E-mail: dpowell@uoguelph.ca

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"PERSPECTIVES FROM NORTH OF THE 49TH"

By JEFFREY FARBER
PRESIDENT

"These are very exciting times for IAFP as we have turned the corner financially and are providing exciting, new services for members"

I hope you are getting as excited as I am about this year's Annual Meeting! Besides the great program we have lined up, we also have a fabulous venue.

Calgary is situated approximately 200 miles (322 km) north of the US border on the banks of the Bow River below the Rocky Mountains. There are two major rivers that run through the city. The Bow River is the largest and flows from the west to the south. The Elbow River flows northwards from the south until it converges with the Bow River near downtown. Although Alberta's second city, Edmonton, is the state capital, Calgary is the territory's commercial and cultural centre and offers hikers, fishermen and lovers of the great outdoors, the pleasure of enjoying the dramatic countryside and splendid national parks. The city is the gateway to the Canadian Rockies, including Banff National Park, which hopefully you will have time to visit.

Millions of years ago, the area around Calgary was part of a huge sea. During the dinosaur era, this area was warm, and hosted not only dinosaurs, but also generous vegetation needed to support such large animals. Over millions of years, this vegetation died and settled on the bottom of this sea. As continents shifted, Calgary became part of North America and the sediments were lifted well above sea level. The pressure of deep layers of rock on the decaying vegetation created the vast oil and gas reserves that drive a large part of Alberta's economy today.

Speaking of dinosaurs, located only 81 mi (130 km) northeast of Calgary in Alberta's Badlands, the Drumheller Valley is best known for its diverse and unique topography. This area provides a vast landscape that is definitely worth visiting (see Monday's tour description on page 341). The world's largest dinosaur statue is situated in downtown Drumheller! The city is probably best known as the home of the Royal Tyrrell Museum of Palaeontology, a world-class facility dedicated to the study of Drumheller's early residents, the dinosaurs. Visitors to the museum can explore hundreds of preserved fossils and take part in interactive displays and exhibits.

The city of Calgary is famous for the Calgary Stampede, a very large agricultural fair and rodeo that takes place every July. The Stampede officially bills itself as "The Greatest Outdoor Show on Earth." It features an internationally recognized rodeo competition, a midway, stage shows, agricultural competitions, chuck wagon races, and First Nations exhibitions, among many other attractions. It is among the largest and most well known festivals in Canada.

Calgary is currently a bustling metropolis with a population of slightly over a million people. The oil and gas boom has created a pleasant situation (for job-seekers!) where there are many more jobs than there are qualified people. In fact, Calgary is now second only to Toronto for its concentration of corporate head offices and boasts a higher GDP per capita than any other major Canadian city.

Although Calgary's winters can be downright cold, Environment Canada still ranks the city as having the third most temperate climate in the country (of major cities) after Victoria and Vancouver. This is due in large part to the dry Chinook winds that routinely blow into the city from the Pacific Ocean during the winter months. These winds have been known to raise the winter temperature by up to 20°C (68°F) in just a few hours, and may last several days or even weeks. The Chinooks are a very common feature of Calgary's winters. Although summer daytime temperatures in the +30s

(high 80s) are not uncommon, due to Calgary's high elevation, the city does not usually experience the extremely high temperatures common to some other Canadian prairie cities. On average, the temperature ranges from a daily minimum of 15°C in January to a daily maximum of 23°C in both July and August. Calgary receives an average of 16.2 inches (413 mm) of precipitation annually, with 11.8 inches (301 mm) of that occurring in the form of rain, and the remainder as snow. It really is in the uncommon energy and its unique combination of adventure, spirit and western hospitality that makes Calgary such a great place to visit. So be sure to try and bring your friends and families to Calgary. You will not be disappointed!

As David mentioned in his March column, by the time you read this column, the Board and IAFP staff will have just met for a strategic planning session. This will give us a chance to take stock of what we have accomplished since the last strategic planning meeting took place, and to plan ahead so that we can be well situated as we head into the next 2–3 year time period. As noted several times in this column these are very exciting times for IAFP as we have turned the corner financially and are providing exciting, new services for members. We will definitely keep you updated on the outcomes of our strategic planning session and would love to have your views on the plan as we move forward.

Finally, a hearty congratulations to our new incoming secretary, Vickie Lewandowski of Kraft! I know that she is going to be a very valuable and hard-working member of our Executive Board. The whole team really looks forward to welcoming Vickie. We would also like to extend our great appreciation to Dr. Leon Gorris for agreeing to run on the slate for secretary. We certainly had two great candidates running for secretary this year!

Dr. J's Science Corner

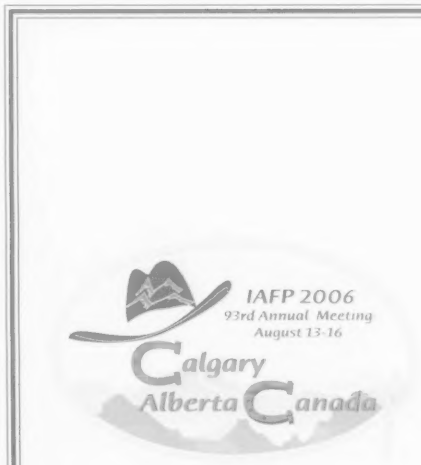
Although there is no proof at present to demonstrate that cats play a role in the transmission cycle of the H5N1 avian influenza virus, the virus has been found in cats in Indonesia, Thailand, Germany and Austria; the scientific community will have to keep a close watch on this one.

As recently reported in the journal *Science*, the virulence of the H5N1 virus may be partially due to a number of previously unnoticed amino acids in a small non-structural protein, referred to as NS1.

I am sure that all you tea aficionados know that the heart-protective properties of tea are due to potent antioxidants called flavenoids. Well, you may not have known that in general, the more processing a tea undergoes, the less flavenoids it will have. In fact, white tea, which is the least processed, has greater antioxidant activity than green tea. Black tea, which is the most processed, contains the least amount of flavenoids.

As always, I can be reached by E-mail at jeff_farber@hc-sc.gc.ca and would love to hear from you!

Have a great month.



IAFP Foundation Fundraisers

Tuesday, August 15 • 6:30 p.m. – 10:00 p.m.

Murder Mystery Dinner at the Deane House

or

Dinner at the Ranche

"COMMENTARY FROM THE EXECUTIVE DIRECTOR"

This month on page 319, we announce the results of our Secretary election. You will see that Vickie Lewandowski received the majority of votes cast and therefore will take office as Secretary upon the conclusion of IAFP 2006. We welcome Vickie to the Executive Board and congratulate her on the success she has enjoyed in the election. We also want to express our gratitude to Leon Gorris who was not elected, but was eager to serve and more than willing to stand for election.

Many Members will recognize that Leon is our first Member from outside of North America to stand for election to the Executive Board. We are proud to be an International organization and look forward to the day when we have our first elected, International Board Member. We wish Leon all successes in the future!

As a note, we will welcome Maria Teresa Destro to the Executive Board in August as the Affiliate Council Chairperson. Maria Teresa is from São Pãulo, Brazil and will represent the Affiliate Council on the Executive Board. Also note, Maria Teresa was elected to serve in this position by the Affiliate Council Members.

Now back to Vickie. By the time you read this column, Vickie will have already participated in our April Board planning session that I talked about in my March column. This will help bring her up to current on future plans and direction for IAFP. As I am writing this column prior to holding our planning session, I cannot report on the outcome of that meeting (watch for a report on the planning session in a future President's column). In addition, Vickie will also spend two days in June at the IAFP offices for "orientation" to the operations of the Association. This time investment will help provide her with background information needed to make informed decisions that will help guide the Association through her service period on the Executive Board.

By DAVID W. THARP, CAE
EXECUTIVE DIRECTOR

"We want to welcome Vickie Lewandowski to the Executive Board and thank Leon Gorris for standing for election!"

Serving on the Executive Board is a big commitment. Each of our elected Board Members serves a total of five years on the Board. Those five years only include the "official" time from becoming Secretary until conclusion of serving a year as Past President. As you can see, Vickie is already contributing her time to the Association (beginning in April) and you can confirm with Past Presidents that service to IAFP many times continues for a year or more after leaving the Board. It may sound like a long time, but the time passes very quickly! Needless to say, we are very fortunate to have many Members who are willing to serve on the Executive Board and who possess the expertise to help guide the Association towards the future. For that we are truly thankful.

Now I want to change direction and call your attention to the proposed changes to both the IAFP Constitution and the Bylaws. Changes are detailed beginning on page 316 and result from two base issues: (1) establishing an electronic newsletter for IAFP, and (2) to allow electronic voting by IAFP Members. The first issue is brought on by our desire to restructure IAFP Member dues (as explained in my April column). The electronic newsletter will become the "publication" that all Members would receive or have access to with their Membership. Each Member will then decide whether they wish to add *FPT*, *JFP*, or *JFP* Online to their base Membership. The electronic newsletter will not replace *FPT* and notices to our Members will continue to be printed in *FPT* in addition to being included in the electronic newsletter.

The issue of electronic voting is something that Members have requested over the last few years as it becomes more commonplace to

conduct elections via the Internet. Various changes need to be made to our voting process to implement an electronic voting system. Mostly, it involves removing the words "mail" or references to a written or paper ballot from the document. At this time, the Board has directed that our 2007 election continue as a paper ballot and that our 2008 Secretary election would be the first use of the electronic Internet system. The proposed time line will allow ample time for communication to all IAFP Members on this issue.

We hope to see Member participation increase dramatically over the roughly 25% of Members who currently vote. The electronic voting system will have many safeguards built in for a secure, online voting experience. We will contract with an outside vendor to conduct the ballot, which removes opportunity for tampering with voting results. Unique login credentials will be required, an independent results tabulator will be engaged, and a third party direct report to the IAFP Teller will be required in the new system.

We take voting privacy and security very seriously and will not do anything to jeopardize a 100% accurate and trusted vote result.

If you have any questions after reviewing the proposed amendments, please take time to call me. It is important that you understand the changes and their effect on the future of the Association.

Once again, we want to welcome Vickie Lewandowski to the Executive Board and thank Leon Gorris for standing for election!

IAFP 2006
93rd Annual Meeting
August 13-16
Calgary
Alberta Canada

Come Early for These Special Events!

Golf Tournament
The Links of GlenEagles
Saturday, August 12
7:30 a.m. – 4:00 p.m.

The Best of Lake Louise and Banff
Saturday, August 12
8:30 a.m. – 5:00 p.m.

Visit the Web site at **www.foodprotection.org** to sign up.

ARTICLES

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International Association for Food Protection

Effect of Added Citric Acid and Acetic Acid on the Survival of *Staphylococcus aureus* and *Listeria monocytogenes* in a Mayonnaise-based Salad

VANESSA L. BORNEMEIER, JULIE A. ALBRECHT,* and SUSAN S. SUMNER**

*Department of Nutritional Science & Dietetics, University of Nebraska, Lincoln, NE 68583-0807, USA

**Department of Food Science, Virginia Polytechnical Institute and State University, Blacksburg, VA 24061, USA

SUMMARY

The study objective was to determine the effect of two concentrations (5% and 10%) of citric acid and acetic acid on the survival of *S. aureus* and *L. monocytogenes* in a mayonnaise-based surimi salad. The pH of a mayonnaise-based surimi salad (control, pH 5.45) was adjusted to approximately 5.0 and 4.6 with 5% and 10% citric acid or acetic acid. Duplicate samples of each salad were inoculated with 10^8 CFU/g *S. aureus* (FRI 100 SEA) or 10^7 CFU/g *L. monocytogenes* (ATCC 49594). *Listeria monocytogenes*-inoculated samples were held at 4°C (refrigeration) for 28 days and 10°C (temperature abuse) for 8 days. Samples inoculated with *S. aureus* were held for 8 days at 10°C. Population samples were analyzed at predetermined intervals. Three replications of the experiment were conducted. At 4°C, a 2 log reduction of *L. monocytogenes* was obtained for the no-acid control sample and the 5% citric acid sample by day 28. A 2.5 log reduction in *L. monocytogenes* was observed for the 5% acetic acid and 10% citric acid sample, and a 3 log reduction was observed for the 10% acetic acid sample. At 10°C, a 1 log reduction of *L. monocytogenes* was observed in the 5% citric acid sample and a 1.5 log reduction in the no-acid control and 10% citric acid samples by day 8. The 5% and 10% acetic acid samples decreased *L. monocytogenes* populations by approximately 2 log at 10°C. For salads inoculated with *S. aureus* at 10°C, a slight reduction in *S. aureus* populations was observed in the no-acid control and the 5% citric acid samples by day 8. A 1.5 log reduction of *S. aureus* occurred in the 5% acetic acid sample, and a 2 log reduction in the 10% citric acid and 10% acetic acid samples. The overall effectiveness of added acidulants on the inactivation of *S. aureus* and *L. monocytogenes* in a mayonnaise-based surimi crab salad were 10% acetic acid > 5% acetic acid > 10% citric acid > 5% citric acid > no acid. However, the addition of acid should not be a replacement for proper temperature control or proper food handling practices.

A peer-reviewed article

*Author for correspondence: Phone: 402.472.8884; Fax: 402.472.1587
E-mail: jalbrecht1@unl.edu

INTRODUCTION

Consumer demand for convenience foods has prompted the popularity of pre-prepared salads from grocery store delis. Mayonnaise-based salads, in particular, are heavily handled during preparation and service by foodservice personnel. Holding conditions are also a concern. As indicated in our initial survey of grocery store delis, mayonnaise-based salads may be held under improper conditions and may be contaminated with microorganisms that cause foodborne disease *(10)*.

Several foodborne illness outbreaks have been reported to be associated with mayonnaise-based salads *(8, 28, 30, 31, 43)*. For many years, it was thought that mayonnaise promoted spoilage and dramatically increased food poisoning risks when added to salads, but in the past 25 years, the microbiological safety of commercial mayonnaise products has been well documented *(17, 22, 42)*. However, when mayonnaise products are combined with other ingredients in salads, the pH level increases. This can produce ideal conditions for microbial growth. Additional acidulant is needed to prevent or inhibit the growth of possible microbial contaminants.

Conner et al. *(15)* demonstrated that *L. monocytogenes* can grow at pH 5.0 to 9.0, but dies off at pH ≤4.6. Several researchers have found acetic acid to have the most inhibitory effect on the growth of *L. monocytogenes*, followed by lactic acid, citric acid, malic acid, and hydrochloric acid *(1, 9, 18, 21, 44)*. Similar results were found with *S. aureus (33)*.

The presence of foodborne pathogens in the processing environment has been widely reported *(12, 27, 41, 46)*. Ryu et al. *(38)* isolated *L. monocytogenes* from ready-to-eat fish products and Buchanan et al. *(13)* reported the incidence of *Listeria* species in seafoods to be approximately 28%. *L. monocytogenes* has also been isolated from surimi analogs *(3, 34)*, frozen seafood samples *(47)*, cooked crab meat *(3)*, and partially cooked scallop-flavored surimi fish cake *(4, 5, 7)*. *Listeria* species were isolated in 32% of seafood salads consisting of fish or seafood analog, mayonnaise, vegetables and spices *(25)*. Yoon and Matches *(49)* reported that pathogens grew rapidly at abusive temperatures in imitation crab legs and flaked crab meat. A Class I recall of crab salad and a seafood spread was found to be contaminated with *L. monocytogenes (6)*. Although *S. aureus* is seldom isolated from seafood products, the pathogen can be found in products that involve extensive handling, such as pickled crab meat *(35)*.

The purpose of this study was to determine the effect of two concentrations of citric acid and acetic acid on the growth of *L. monocytogenes* at 4°C (refrigeration) and *S. aureus* and *L. monocytogenes* at 10°C (abusive temperature) in a mayonnaise-based surimi krab salad (initial pH 5.45) at predetermined time intervals.

MATERIALS AND METHODS

Salad preparation

One type of mayonnaise-based salad, surimi-processed fish (krab) salad, was selected for assessment on the basis of findings of the initial microbial survey of grocery store delicatessens *(10)*. The basic recipe formulation was taken from a quantity foods textbook *(40)*. Surimi krab salad was prepared in sterile glass bowls with sterile utensils by mixing together the following ingredients until they were completely coated with mayonnaise: 230.0 g surimi-processed fish, 56.8 g diced celery, 17.0 g chopped black olives, 108.2 g mayonnaise, 1.5 g salt, 0.25 g pepper, and 56.8 g shredded mild cheddar cheese. All salads were prepared in duplicate with ingredients purchased at a local supermarket. Perishable ingredients were stored at 4°C and used within 24 h. Raw vegetables were washed under warm tap water for approximately 60 s, drained, and chopped by hand, using a sterile knife and cutting board to simulate actual practices.

Culture preparation and salad inoculation

One strain of *L. monocytogenes* (ATCC 49594) and one strain of *S. aureus* (FRI 100 SEA) were used. Frozen stock cultures (0.1 ml) were activated by transfer to 10 ml brain heart infusion broth (Difco, Detriot, MI) and incubated for 22–24 h at 35°C. The initial cell concentration was approximately 10^9 CFU/ml.

The pH of the mayonnaise-based surimi krab salad (control, pH 5.45) was adjusted to approximately 5.0 and 4.6 with 5% and 10% citric acid or acetic acid by adding 20 ml of acid to approximately 467 g surimi krab salad. Twenty ml distilled water was added to the no-acid control salad. For each type salad with added acid, 50 g portions were weighed into 10 individual sterile pint jars and covered with sterile blending lids. Seven jars were inoculated with 0.2 ml of *L. monocytogenes* culture and three were inoculated with 0.2 ml of *S. aureus* culture. The salads were vigorously hand-mixed for approximately 2 min to ensure homogeneous distribution of the microorganisms. The target concentration level was 10^8 CFU/g. Ten additional samples were used as the uninoculated controls. Five of the *L. monocytogenes*-inoculated salad samples were stored at 4°C (refrigeration), while the remaining two were held at 10°C (moderate temperature-abuse simulation). The three samples inoculated with *S. aureus* were stored at 10°C. Three replications of the experiment were done.

Microbiological methods and analyses

The temperature-abused salad samples inoculated with either *S. aureus* and *L. monocytogenes* were analyzed at day 0, 4 and 8, while the refrigerated *L. monocytogenes* inoculated samples were analyzed at day 0, 7, 14, 21 and 28. Total aerobic organisms were analyzed at the beginning and end of each trial. Each sample was analyzed by weighing a 25 g portion into 225 ml peptone buffer (Difco, Detroit, MI), blending for 2 min, and plating serial dilutions on appropriate selective media.

For *S. aureus*, salad samples dilutions were surface plated on Baird-Parker agar containing EY Tellurite (Becton Dickinson, Cockeysville, MD). Salad sample dilutions were surface plated on MOX agar for *L. monocytogenes*. For total aerobic microorganisms, dilutions were plated on PCA (Difco, Detroit, MI). Baird Parker and PCA plates were incubated for 48 h at 37°C, while MOX agar plates were incubated for 24 hrs at 35°C. Microorganisms were enumerated with a colony counter (Fisher Scientific Co., Pittsburgh, PA) and results were calculated and recorded as $\log_{10}$ CFU/g. Baird Parker agar and PCA agar were prepared and sterilized according to manufacturer's label directions, and MOX agar preparation followed the instructions of McCain and Lee *(32)*. Surface colonies were randomly checked to verify that the selective pathogen counts were accurate and consistent. *S. aureus* colonies were confirmed by the coagulase test *(45)* and *L. monocytogenes* were confirmed using API strips (Difco, Detroit, MI). The control samples were surface plated at the same storage intervals as the pathogen inoculated samples and were analyzed for total aerobic microorganisms, *S. aureus* and *L. monocytogenes*.

pH

A blender (Oster, Milwaukee, WI) was used to homogenize a 25-g sample of each salad in 100 ml distilled water for approximately 2 min at the high setting. Two min after blending, pH readings were obtained on an Accument pH meter (Fisher Scientific, Pittsburgh, PA).

TABLE 1. Target initial and actual initial pH values for surimi krab salad inoculated with *L. monocytogenes* or *S. aureus*

Salad	Target pH	Actual pH[1]	
		L. monocytogenes Inoculated Salad (4°C and 10°C)	*S. aureus* Inoculated Salad (10°C)
Control (not inoculated)	5.4	5.45	5.42
No Acid Control	5.4	5.48	5.47
5% Citric Acid	5.0	4.92	4.95
10% Citric Acid	4.6	4.46	4.63
5% Acetic Acid	5.0	5.04	5.08
10% Acetic Acid	4.5	4.53	4.68

[1]Average of six samples

Statistical analysis

Data were entered into SAS and analyzed using a variation of a split-plot model design with analysis of variance (ANOVA) and Least Square Means *(39)*.

RESULTS

Initial pH values for each trial were targeted at 5.4 for the control and no-acid control salad samples, 5.0 for the 5% citric acid and 5% acetic acid salad samples, and 4.6 for the 10% citric acid and 10% acetic acid salad samples. Target initial and the average of the actual initial pH values for all three trials are listed in Table 1.

For all salad samples inoculated with *L. monocytogenes* at 4°C, the pH values decreased gradually from day 0 through day 28, but the changes in pH were not significant ($P > 0.05$) (Table 2). For all samples inoculated with *S. aureus* and *L. monocytogenes* at 10°C (Tables 3 and 4), a gradual but nonsignificant ($P > 0.05$) decline in pH occurred from day 0 through day 8.

L. monocytogenes populations decreased significantly ($P < 0.01$) in the no-acid control sample from day 0 through day 7 in a surimi krab salad held at 4°C (7.30 to 5.67 $\log_{10}$ CFU/g) and continued to decrease through day 28 (Table 2). Populations of *L. monocytogenes* in the 5% citric acid sample decreased significantly ($P < 0.01$) from day 0 through day 14 (6.84 to 5.29 $\log_{10}$ CFU/g) and continued to decrease though day 28 (Table 2). A significant ($P < 0.01$) reduction in *L. monocytogenes* populations was observed for the 5% acetic acid sample from day 0 through day 7 (7.21 to 5.58 $\log_{10}$ CFU/g), and *L. monocytogenes* populations decreased by an additional 1 log from day 7 through day 28 (Table 2). For the 10% citric and 10% acetic acid samples, *L. monocytogenes* populations decreased significantly ($P < 0.01$) from day 0 through day 28. A significant ($P < 0.01$) difference in *L. monocytogenes* populations was observed between the no acid control sample and the 10% acetic acid sample at day 28 (Table 2). No significant ($P > 0.05$) difference in *L. monocytogenes* populations was observed between the no-acid control sample and the 5% citric acid, 10% citric acid, or 5% acetic acid samples from day 0 through day 28 (Table 2).

At 10°C, *L. monocytogenes* populations in a surimi salad decreased significantly ($P < 0.01$) from day 0 through day 8 in the no-acid control (7.30 to 5.81 $\log_{10}$ CFU/g) and the 5% acetic acid samples (7.21 to 5.39 $\log_{10}$ CFU/g) (Table 3). A 1 log decrease in *L. monocytogenes* populations was observed from day 0 through day 8 in the 5% citric acid sample, but the change in populations was not significant ($P > 0.05$). A significant ($P < 0.01$) decrease in *L. monocytogenes* populations occurred from day 0 through day 4 in the 10% citric acid (6.95 to 5.39 $\log_{10}$ CFU/g) and 10% acetic acid (7.18 to 5.15 $\log_{10}$ CFU/g), and a slight decrease in populations was observed from day 4 though day 8 (Table 3). By day 8 no significant ($P > 0.05$) difference in *L. monocytogenes* populations was observed between the no-acid control sample and the 5% citric acid, 10% citric acid, 5% acetic acid or 10% acetic acid samples (Table 3).

For salads inoculated with *S. aureus* and held at 10°C, no significant change in *S. aureus* populations was observed in the no-acid control sample and the 5% citric acid sample between day 0 and day 8 (Table 4). A significant ($P < 0.05$) decline of *S. aureus* populations for the 10% citric acid sample was observed from day 0 through day 8 (7.93 to 5.98 $\log_{10}$ CFU/g). *S. aureus* populations decreased significantly ($P < 0.05$) in the 5% acetic acid (7.94 to 6.63 $\log_{10}$ CFU/g) and 10% acetic acid (7.76 to 5.65 $\log_{10}$ CFU/g) samples from day 0 through day 4, and a slight decrease in populations was observed though day 8 (Table 4). By day 8, a significant ($P < 0.05$) difference was observed between the decrease in *S. aureus* populations in the no-acid control sample and the decrease in aerobic populations observed in the 10% citric acid and 10% acetic acid samples. At day 8, no significant difference in populations was observed between the 5% citric acid, 10% acetic acid and 10% citric acid samples.

Changes in total aerobic populations levels are represented in Table 5. All uninoculated surimi krab salad samples contained low levels of aerobic microorganisms at the time of inoculation, with an average aerobic plate count of < 2 $\log_{10}$ CFU/g. For the samples inoculated with *L. monocytogenes* at 4°C, no significant change ($P > 0.05$) in aerobic populations was observed in the no-acid control, 5% citric acid, and 5% acetic acid samples between day 0 and day 28, although a 1 log reduction did occur for the 5% citric acid and 5% acetic acid samples. Aerobic populations significantly ($P < 0.01$) decreased

TABLE 2. pH and *L. monocytogenes* populations in a surimi krab salad held at 4°C for 28 days

	Day 0	Day 7	Day 14	Day 21	Day 28
pH					
Control (not inoculated)	5.45	5.42	5.25	5.23	5.12
No Acid Control	5.48	5.48	5.24	5.27	5.07
5% Citric Acid	4.92	4.97	4.95	4.87	4.83
10% Citric Acid	4.46	4.57	4.48	4.44	4.43
5% Acetic Acid	5.04	5.02	4.94	4.89	4.88
10% Acetic Acid	4.53	4.54	4.49	4.42	4.39
Listeria (log_{10} CFU/g)					
Control (not inoculated)	0	0	0	0	0
No Acid Control	7.30[a]	5.67[a]	5.56[b]	5.63[b]	5.25[b12]
5% Citric Acid	6.84[a]	5.82[a]	5.29[a]	4.96[b]	4.91[b2]
10% Citric Acid	6.95[a]	5.57[a]	5.16[a]	4.78[a]	4.39[a2]
5% Acetic Acid	7.21[a]	5.58[a]	5.09[b]	4.71[b]	4.50[b2]
10% Acetic Acid	7.18[a]	5.26[a]	5.01[a]	4.31[a]	4.06[a1]

[a]significant at $P < 0.01$ horizontally

[b]not significant ($P > 0.05$) horizontally

[1]significant at $P < 0.01$ vertically

[2]not significant ($P > 0.05$) vertically

from day 0 through day 28 in the 10% citric acid and 10% acetic acid samples. There was also a significant ($P < 0.01$) difference between the decrease in aerobic populations observed in the no-acid control sample and the decrease observed in the 10% acetic acid sample by day 28. No significant difference in the decrease of aerobic populations was observed between the no-acid control sample and the 5% citric acid, 10% citric acid or 5% acetic acid samples between day 0 and day 28. However, it was observed by day that 10% acetic acid had reduced *L. monocytogenes* populations by 1 log unit more than was seen in the no-acid control sample (Table 5).

For the salad samples inoculated with *L. monocytogenes* at 10°C, total aerobic populations decreased significantly ($P < 0.01$) from day 0 through day 8 in the 5% acetic acid sample (8.42 to 6.50 log_{10} CFU/g), 10% acetic acid sample (8.29 to 5.72 log_{10} CFU/g) and 10% citric acid sample (8.53 to 5.80 log_{10}CFU/g) (Table 5). No significant change in aerobic populations was observed in the no-acid control and 5% citric acid samples, although microbial populations were reduced by approximately 1 log (Table 5). A significant ($P < 0.01$) difference was observed between the decreases in aerobic populations in the no-acid control, 10% citric acid and 10% acetic acid samples. No significant ($P > 0.05$) difference was observed in the decrease of aerobic populations between the no acid control sample and the 5% citric acid, 10% citric acid, or 5% acetic acid samples between day 0 and day 8. However, the 5% acetic acid sample did have *L. monocytogenes* populations 1 log unit lower more than the no-acid control sample by day 8 (Table 5). For samples inoculated with *S. aureus* at 10°C, there was no significant change in aerobic populations from day 0 through day 8 in the no-acid control, 5% citric acid, 10% citric acid, and 5% acetic acid samples (Table 5). Aerobic populations decreased significantly ($P < 0.01$) in the 10% acetic acid sample from day 0 through day 8 (8.21 to 6.26 log_{10} CFU/g) (Table 5). A significant ($P < 0.001$) difference was observed between the decrease in aerobic populations in the no-acid control sample and the 10% acetic acid sample by day 4. At day 8, no significant difference was found between the *L. monocytogenes* populations in the no-acid control sample versus the 5% citric, 10% citric, or 10% acetic acid samples.

No significant difference in antimicrobial effect was observed between acetic acid and citric acid on *L. monocytogenes* or *S. aureus* populations, although acetic acid was observed to consistently reduce pathogenic microorganisms to lower populations than citric acid. Throughout this study, it was observed that 10% acetic acid consistently reduced *L. monocytogenes* or *S. aureus* to lower populations than 5% acetic acid, but the inhibitory effect was not found to be significantly different between the two concentrations. The same was observed for citric acid.

DISCUSSION

Results from our study indicate that, over time, no significant change in pH level occurred in any of the mayonnaise-

TABLE 3. pH and *L. monocytogenes* populations in a surimi krab salad held at 10°C for 8 days

	Day 0	Day 4	Day 8
pH			
Control (Not inoculated)	5.45	5.38	5.39
No Acid Control	5.48	5.30	5.35
5% Citric Acid	4.92	4.83	4.84
10% Citric Acid	4.46	4.48	4.40
5% Acetic Acid	5.04	4.88	4.78
10% Acetic Acid	4.53	4.52	4.48
Listeria (log_{10} CFU/g)			
Control (not inoculated)	0	0	0
No Acid Control	7.30[a]	6.17[a]	5.81[a|]
5% Citric Acid	6.84[b]	5.68[b]	5.67[b|]
10% Citric Acid	6.95[a]	5.39[a]	5.26[b|]
5% Acetic Acid	7.21[a]	6.05[a]	5.39[a|]
10% Acetic Acid	7.18[a]	5.15[a]	5.00[b|]

[a] significant at $P < 0.01$ horizontally

[b] not significant ($P > 0.05$) horizontally

[|] not significant ($P > 0.05$) vertically

based surimi krab salad samples, although a gradual decline in pH was observed. It has been found that the spoilage of mayonnaise-based salads is predominately caused by heterofermentative lactic acid bacteria *(20)*. Therefore, the gradual decline in pH over time could be attributed to the presence of lactic acid bacteria, which ferment lactose to lactic acid and may thus have contributed to the pH reduction of the salads. Certain lactic acid bacteria can grow not only at abusive temperatures but also at refrigeration temperatures *(2)*, which would also account for the gradual decline in pH observed in salad samples inoculated with *L. monocytogenes* at 4°C.

Results indicate that the no-acid control samples inoculated with *L. monocytogenes* were effective significantly in reducing listerial populations at both 4°C and 10°C, but they were not effective in reducing populations of *S. aureus* at 10°C. The mayonnaise in the simulated surimi krab salad could possibly account for the inhibitory effect of the no-acid control samples on *L. monocytogenes* populations. Federal standards require that commercially manufactured dressings such as mayonnaise have a pH of less than or equal to 4.1 and an acetic acid level greater than or equal to 1.4% of the aqueous phase *(22)*. These conditions were established to assure destruction of pathogenic microorganisms and were based on studies of Wethington and Fabian *(48)*. Our findings (approximately 2 log reduction) are consistent with the results reported by Glass and Doyle *(23)*, which indicated that mayonnaise could inactivate >10^4 *L. monocytogenes* per gram within 72 hours. Erickson et al. *(20)* concluded that the combination of mayonnaise and refrigeration inhibited *L. monocytogenes* outgrowth for > 7 days. Other studies have also identified an antimicrobial effect of mayonnaise *(11, 14, 19)*.

Our results indicate that added acidulants were effective in reducing populations of *L. monocytogenes*, *S. aureus*, and aerobic microorganisms in a mayonnaise-based surimi krab salad. The most effective acidulant was acetic acid, which reduced total aerobic microorganisms by approximately 1 log at 4°C and 10°C. Overall, at the same pH level, acetic acid, was found to be more effective than citric acid for reducing pathogenic microorganisms, which corresponds to findings from other studies *(16, 33, 36, 44)* Farber et al. *(21)* and Sorrels et al. *(44)* evaluated *L. monocytogenes* behavior in laboratory media supplement with various inorganic and organic acids. They identified acetic acid as the most effective antilisterial acidulant. Glass et al. *(24)* demonstrated that acetic acid was significantly more effective than malic or citric acids in controlling *L. monocytogenes* in a queso blanco cheese. *Salmonella* was killed in mayonnaise acidified to pH 4 with acetic acid, but not with citric acid at the same pH *(37)*. In another study, acetic acid was found to inhibit *L. monocytogenes* at pH 4.5 and citric acid at pH 4.0 *(16)*.

The difference in antimicrobial effectiveness of acetic acid and citric acid could be attributed to the structure of the acid. The antimicrobial activity of weak acids generally correlates with their pK_a values *(24)*. It has been observed that weak acids, (higher pK_a) such as acetic acid have greater antimicrobial activity against *Listeria* species than stronger acids (lower pK_a) such as citric acid *(1, 16, 18, 29, 44)*,

TABLE 4. pH and *S. aureus* populations in a surimi krab salad held at 10°C for 8 days

	Day 0	Day 4	Day 8
pH			
Control (Not inoculated)	5.42	5.36	5.30
No Acid Control	5.47	5.35	5.27
5% Citric Acid	4.95	4.92	4.74
10% Citric Acid	4.63	4.56	4.52
5% Acetic Acid	5.08	5.06	4.68
10% Acetic Acid	4.68	4.66	4.57
S. aureus (log_{10} CFU/g)			
Control (Not inoculated)	0	0	0
No Acid Control	8.06^{b}	7.46^{b}	7.40^{b12}
5% Citric Acid	7.79^{b}	7.48^{b}	7.47^{b23}
10% Citric Acid	7.93^{a}	6.91^{a}	5.98^{a13}
5% Acetic Acid	7.94^{a}	6.63^{a}	6.35^{b2}
10% Acetic Acid	7.76^{a}	5.65^{a}	5.48^{b13}

[a]significant at $P < 0.01$ horizontally

[b]not significant ($P > 0.05$) horizontally

[1,3]significant at $P < 0.01$ vertically

[2]not significant ($P > 0.05$) vertically

which supports the findings from our study.

The concentration of the acidulant corresponded to its antimicrobial effectiveness in our study. A 10% acid concentration (which resulted in a pH value of 4.6) was more effective than a 5% acetic acid concentration (which corresponded to a pH of 5.0) in reducing the populations of *L. monocytogenes* at both 4°C and 10°C. Microbial inactivation rates were found to be inversely related to acid concentration and pH level for both *L. monocytogenes* and *S. aureus*. Our results are consistent with those of Conner et al. *(16)*, who found that the antimicrobial activity of many organic acids was correlated to the concentration and pH level of the acid. Higher concentrations, with correspondingly lower pH levels, were reported to reduce pathogenic microorganisms more effectively than lower concentrations for acetic, lactic, citric and proprionic acids *(16)*. Ahamad and Marth *(1)* examined the ability of different concentrations of acetic, citric, and lactic acid to prevent growth of *L. monocytogenes* in tryptic soy broth and found that increasing acid concentration of acetic, citric or lactic acid from 0.05% to 0.2% completely suppressed growth of *L. monocytogenes (1)*.

Our results indicate that the effect of added acidulants on the antimicrobial activity of *L. monocytogenes* in a mayonnaise-based surimi krab salad did not differ significantly between the salads held at 4°C and those held at 10°C. This agrees with the findings of Wethington and Fabian *(48)*, who reported that *Salmonella* inactivation in mayonnaise is unaffected by temperature. In contrast, other researchers have found that higher incubation temperatures enhance the lethal effect of acids on pathogenic microorganisms *(23)*; the higher the incubation temperature, the greater the rate of listerial inactivation. In survival studies conducted in trypic soy broth acidified with various acids, *L. monocytogenes* was inactivated at a much higher rate at 30°C than at 10°C for all acid treatments *(16)*. *L. monocytogenes* could tolerate exposure to citric acid in tryptic soy broth far better at 7°C than at 35°C *(1)*. Refrigeration temperatures appeared to provide some protection to *L. monocytogenes* against the stressful effects of low pH in foods *(15)*, a finding that is not supported by our results. It should be noted, however, that the incubation period in our study varied between the salads held at 4°C (28 days) and those held at 10°C (8 days) for the acid-adjusted salads inoculated with *L. monocytogenes*. Therefore, it may not be justified to compare the two temperatures. We might have obtained different findings if the incubations periods were the same for both temperatures.

Our results indicate that at 10°C, acetic acid and citric acid similarly reduced populations of *L. monocytogenes* and *S. aureus* in a mayonnaise-based surimi krab salad. Similar inactivation rates occurred between day 0 and day 8 for both pathogenic microorganisms. These results correspond to those of a study conducted by Buchanan and Phillips *(13)*, who found that the inactivation rate of *L. monocytogenes* did not differ significantly from that of other pathogenic microorganisms in an acidic environment. Also, Erickson and Jenkins *(19)* observed that the inactivation of *L. monocytogenes* was similar to that of *Salmonella* species in commercial mayonnaise products.

TABLE 5. Initial and final total aerobic populations (log_{10} CFU/g) for surimi krab salads

	L. monocytogenes inoculated salad (4°C for 28 days) (log_{10} CFU/g)		*L. monocytogenes* inoculated salad (10°C for 8 days) (log_{10} CFU/g)		*S. aureus* inoculated salad (10°C for 8 days) (log_{10} CFU/g)	
	Initial	**Final**	**Initial**	**Final**	**Initial**	**Final**
Control (not inoculated)	1.77	2.15	1.77	2.17	1.82	2.58
No Acid Control	8.60^{b}	7.87^{b12}	8.60^{d}	7.78^{d3}	8.27^{f}	8.84^{f5}
5% Citric Acid	8.26^{b}	7.23^{b2}	8.26^{d}	7.16^{d4}	8.17^{f}	8.55^{f6}
10% Citric Acid	8.53^{a}	6.68^{a2}	8.53^{c}	5.80^{c3}	8.11^{f}	7.35^{f6}
5% Acetic Acid	8.42^{b}	7.35^{b2}	8.42^{c}	6.50^{c4}	8.01^{f}	7.98^{f6}
10% Acetic Acid	8.29^{a}	6.37^{a1}	8.29^{c}	5.72^{c3}	8.21^{e}	6.26^{e5}

^{a,c,e}significant at $P < 0.01$ horizontally between initial and final pairs

^{b,d,f}not significant ($P > 0.05$) horizontally between initial and final pairs

^{1,3,5}significant ($P < 0.01$) vertically in decrease in population

^{2,4,6}not significant at $P > 0.05$ vertically in decrease in population

Our results indicate that mayonnaise alone can reduce *L. monocytogenes* and *S. aureus* populations in a mayonnaise-based surimi krab salad. Acidulants such as acetic acid and citric acid added to the mayonnaise-based salads were even more effective than mayonnaise alone in inhibiting the growth of pathogenic microorganisms. Our results indicate that the overall effectiveness of added acidulants on the inactivation of *S. aureus* and *L. monocytogenes* in a mayonnaise-based surimi salad were 10% acetic acid > 5% acetic acid > 10% citric acid > 5% citric acid > no acid. However, although organic acids may lessen the threat of listeriosis and staphylococcal food poisoning in mayonnaise-based salads, acidulants should not be considered a replacement for proper temperature control or proper food handling practices, and the question remains as to whether the taste and appearance of the product are acceptable to the consumer. Consumer acceptance of mayonnaise-based surimi krab salads with the addition of acetic or citric acid was not investigated in this study, but it is an important issue that requires additional research.

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New England Home Gardeners' Food Safety Knowledge of Fresh Fruits and Vegetables

LORI F. PIVARNIK,[1*] MARTHA S. PATNOAD,[1] NICOLE LEYDON,[1] and ROBERT K. GABLE[2]
[1]University of Rhode Island, Nutrition and Food Sciences Department, 530 Liberty Lane, West Kingston, RI 02892, USA; [2]Educational Psychology, University of Connecticut, Educational Leadership Doctoral Program, Johnson and Wales University, 26 Quail Run Road, Storrs, CT 06268, USA

SUMMARY

The objective of this research was to assess the knowledge of and attitudes toward Good Agricultural Practices of home gardeners in New England (NE). A survey was designed to measure food safety knowledge and attitudes regarding growing and handling of produce by home gardeners. By use of a professionally generated mailing list, a questionnaire was distributed to 5,000 randomly selected households of gardeners in 5 NE states. Respondents answered questions on food safety topics for all aspects of gardening and post-harvest handling. "Agree," "disagree" and "don't know," as well as Likert scale response formats, were used. Content validity and reliability were determined. Fifty-six knowledge questions for 762 respondents were assessed at item level and by use of five categories of gardening timeline (e.g., soil preparation, planting) and four categories of content (e.g., sanitation water quality). Mean percent correct ranged from 61 to 71 for timeline and from 59 to 74 for content areas, with the lowest scores for prior to planting/soil preparation and water quality. With 80% taken as subject mastery standard, respondents met the standard for only 23 of 56 items (41%). Topics scoring low concerned use of fresh manure /compost, safety of organically grown produce, cleaning produce, water safety and home canning. Responses to attitudinal questions, alpha reliability score of 0.75, were generally supportive of proper home gardening practices; however, the relationship between attitude and knowledge was lower than expected (r = .23). Significantly higher levels of knowledge ($P < .01$) for timeline and/or content categories were found for respondents with higher number of income, higher number of gardening years or Master Gardener certification.

INTRODUCTION

The microbial safety issues associated with commercially grown fresh produce have been well documented *(2)*. During the past three decades, the consumption of fresh fruits and vegetables has increased in the United States *(10, 19)*. Along with this increase, public health officials and the CDC have documented an increase in produce-related foodborne illnesses *(10, 19, 21)*. This increase in outbreaks of foodborne illnesses contracted from eating fresh fruits and vegetables strongly suggests the need for better handling practices from grower to consumer *(15)*. A variety of types of fresh produce have been implicated in these outbreaks, with causes attributed to many different bacteria, viruses and protozoa *(21)*. In the period 1973 through 1997, produce-associated outbreaks accounted for 6% of total outbreaks in the 1990s, up from 0.6% in the 1970s *(19)*. Pathogens can be found in the interior of certain fruits and vegetables as well as on the surface; they can enter leaves through the stomata, and can enter fruit through the stem, stem scar or calyx, as well as entering through damage or soft rot of the natural structure *(9)*. Insects, animals and birds can act as vectors for human pathogens *(9)*. A review of literature pertaining to microbial hazards associated with fresh fruits and vegetables grown commercially revealed

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*Author for correspondence: Phone: 401.874.2972; Fax: 401.874.2994
E-mail: pivarnik@uri.edu

Escherichia coli O157:H7, *Salmonella* spp., and *L. monocytogenes* as bacterial pathogens of significant concern with regard to fresh produce safety *(3, 4, 13, 16)*. Certain kinds of produce provide better conditions for pathogen survival and growth than others *(8)*. Because fresh produce does not undergo a "kill" step to remove pathogens, agricultural commodities must now be thought of as "ready-to-eat" foods.

In an effort to ensure the safety of produce and to enhance and upgrade standards, the FDA and USDA developed guidelines that outline Good Agricultural Practices (GAP) for commercial growers/producers *(7)*. These strategies were designed to minimize the microbial safety hazards associated with fresh and minimally processed fruits and vegetables. The guidance document addresses common Good Agricultural Practices (GAP) associated with the production of fruits and vegetables, such as water, manure application, worker hygiene/sanitation, and post-harvest handling. However, risks associated with these should not be assumed to be confined to commercially produced fruits and vegetables. On the contrary, home gardeners, because of their limited educational intervention and resources, should be considered as sources of risk. Although, considerable effort has been made in recent years to integrate GAP food safety practices on commercial farms, the guidance and educational efforts have *not* been directed at the home fruit and vegetable gardeners and no direct efforts have been made to assess the impact of home fruit and vegetable gardening practices on microbiological safety. The consumer has always been the least and last studied in the food chain, and information is largely anecdotal *(17)*. Retrospective analysis of food poisoning provides relatively little information because consumers often find it difficult to recall their food intake and handling practices *(17)* and fail to associate home food practices with foodborne illness. Researchers and outreach educators cannot assume that lack of reported cases or outbreaks associated with home grown products translate to a lack of food safety risks.

According to a Gallup poll conducted by the National Gardening Association *(5)*, 29% of all US households participated in vegetable gardening in 1999, an increase of 19% over the previous 5-year average. Of the 31 million US households that participate in home gardening, 6 million are in the East (New England and mid-Atlantic), with 2 million in New England alone. This represents a large potential audience for GAP food safety educational intervention. Given that under-reporting of foodborne outbreaks, it has been estimated that close to 50% of all foodborne illnesses result from outbreaks that originate from exposure to pathogens at home *(6)*. Furthermore, consumers are not likely to consider food from their own homes as the source of an illness *(17)*. As a result, GAP food safety prevention practices must be not only implemented at the commercial farm but also adapted for home food production, where there is little or no oversight. Although this may represent a large potential audience for GAP food safety educational intervention, there has been little or no assessment of home gardening practices and risks, which is ultimately necessary to design the most effective outreach strategy.

A scientific assessment for the FDA by the Institute of Food Technologists *(8)* of fresh produce with regard to prevention, control, reduction and/or elimination of microbial hazards had an industrial focus. However, many of the same issues associated with commercial agriculture could easily apply to home grown products. Water quality problems due to pathogen contamination can impact both commercial grower and domestic user *(8)*, because of the lack of state/local regulations requiring periodic testing of well water used in private homes. Issues associated with contamination from wild and domestic animals are also common to both. Increased use of manure that may be improperly treated or composted could introduce pathogens such as *Salmonella* spp. or *E. coli* O157:H7 *(21)*. A survey of commercial composting facilities showed that 33% were *not* meeting the required minimum standards to eliminate pathogens *(14)*. This increased use of organic or "natural" fertilizer is not confined to commercial growers; over a 6-year period, there has been a 50–60% increase in the use of similar products (manure and natural/organic fertilizers) by home vegetable gardeners, and purchase of composting bins has increased 2.5 times *(5)*. However, no evaluation of home gardening practices has been carried out. With home vegetable gardeners increasingly using "natural" products and compost comprised of garden leaf litter, produce waste and other organic material, food safety risks in home gardens must be assessed and educational initiatives must be implemented. Furthermore, incorrect post-harvest handling, such as washing and storing, has been identified as impacting the safety of fruits and vegetables produced on a commercial scale *(8)* could be an important concern for home gardening, as consumers are not even adequately washing produce obtained from markets *(1)*. Consumers have been shown to handle fresh produce poorly from time of purchase to plate *(12)*.

The overall objective of this study was to assess the knowledge of and attitudes toward Good Agricultural Practices of home gardeners in New England in an effort to develop outreach programs that would improve their food safety practices.

METHODOLOGY

Sampling and data collection

Following the model of Salant and Dillman *(18)*, a total of 5,000 questionnaires were mailed in two complete mailings to randomly selected households throughout five New England states (CT, NH, ME, VT and RI). The randomized mailing lists, weighted as to state population, and labels, purchased from New Am-Pro Mailing List Company, Danvers, MA, had been generated by the company from lists associated with gardening magazines, etc. The questionnaire, along with a cover letter, postage-paid return envelope and one fruit or vegetable recipe was mailed to each household. The questionnaire was completed anonymously. The complete survey packet was mailed a second time, with instructions to those who had already responded to the first solicitation to disregard the second. The initial mailing was completed in April 2004, with the second done three weeks later.

The first and second mailings generated 67% and 33% of all responses received, respectively. Sixty-seven surveys were returned as "undeliverable," and 21 were returned without any answers. Of the 885 questionnaires returned, 54 were from consumers with no gardening experience and 69 were discarded because of incomplete question responses. Therefore, 762 (15%) completed questionnaires were used in the analysis. The 1% of completed questionnaires that reflected consumers with no gardening experience were used as a comparison group when knowledge responses were evaluated against home gardening experience.

TABLE 1. Demographic characteristics of survey respondents (n = 762)

	Frequency	Percent
Age		
Under 39	82	11
40–59	367	48
60 and older	312	41
Gender		
Male	294	43
Female	396	57
Combined Household Income (Before taxes):		
Less than $29,999	140	20
Between $30,000–$49,999	170	24
Between $50,000–$69,999	159	23
Greater than $70,000	230	33
Last Educational Level Completed		
Less than 9th Grade to Some High School	32	4
High School Graduate or GED	160	21
Some College to College Degree	423	56
Post Graduate Degree	144	19
Type of Area in Which You Live		
Rural Area (less than 1,000 residents)	63	8
Small Town (1,000 to 9,999 residents)	317	42
Suburban Area (10,000 to 99,999 residents)	323	43
City (over 100,000 residents)	55	7
State of Residence		
Connecticut	347	46
Maine	168	22
New Hampshire	111	15
Rhode Island	78	10
Vermont	57	7
Number of Years Gardening		
1–10	241	32
11–20	199	26
21–30	143	19
31–40	93	12
40+	86	11
Have You Completed a Master Gardener Program?		
Yes	18	2
No	742	98
Source of Gardening Knowledge (Chose all that applied)		
Family or Friends	679	89
Books/Magazines	578	76
Garden Center	354	47
Newspaper/Television/Radio	302	40
University/Extension	159	21
Internet	153	20
Other	65	9

Data analysis

Data analysis was carried out using the SPSS statistical program, version 11.0 *(20)*. Descriptive analyses (frequencies, distributions, ranges, standard deviations) were computed for all variables. One-way ANOVA followed by the Scheffe post hoc procedure, t-tests and chi-square statistics were performed to determine statistical differences between means. Items means were rank ordered. Reliability was examined for the timeline and content categories and for attitude scores by use of Cronbach's alpha measure of internal consistency. Knowledge measurements pertaining to fruit and vegetable food safety were correlated with demographic variables. Significant findings were reported at $P < 0.05$ or $P < 0.01$, as noted.

Questionnaire

Respondents answered questions on food safety topics for all aspects of gardening and post-harvest handling of home grown fruits and vegetables. The questionnaire was divided into three parts: demographics, knowledge, and attitudes. The demographic section contained questions regarding age, gender, household income, education, state of residence, living area, years of gardening and source of gardening information. Fifty-six knowledge questions were assessed at the item level and by using five gardening timelines/categories (general fruit/vegetable food safety, prior to planting/soil preparation, during planting/growing, harvesting and post-harvest handling) and four content categories (foodborne illness, sanitation/hygiene, composting/manure application, and water). Other than those questions that were grouped in a "foodborne illness" category and reflected specific bacterial and post-harvest handling questions, other "content" areas were designated as per existing GAP principles that would impact home gardening. The response for these questions was disagree, agree or don't know. Knowledge-based questions were graded as right or wrong. For purposes of statistical assessment, "don't know" was considered a wrong answer. Subject mastery, at 80% correct, was determined by the 6 content experts in the field of Nutrition and Food Sciences.

Because researchers have reported a link between attitude and practice *(11)*, a set of attitude questions was included in this survey. Ten attitude statements describing food safety aspects of home gardening were rated on a 5-point Likert scale with 1 = strongly disagree and 5 = strongly agree. Generally, questions fell into two categories: (1) questions that reflected gardeners' feelings concerning safety of fruits and vegetables from home gardens versus those from commercial sources (e.g., markets) and (2) questions exploring home gardener attitudes concerning their responsibility for the safety of the produce they grow. The attitude questions were included in the survey to help describe home gardeners' thoughts regarding the importance of home gardening practices to food safety and their perceptions of the safety of retail versus home grown produce.

The protocol and questionnaire were approved by the University of Rhode Island Institutional Subjects Review Board and the questionnaire items were reviewed for content validity and clarity by the 9 food safety experts from the other New England State/Land Grant Universities and by one RI state agricultural marketing specialist. Nine Master Gardener volunteers and 21 home gardeners participated in a pilot survey to assess readability and assist in the examination of content reliability. All suggested changes were considered and the questionnaire was revised based on these recommendations.

RESULTS AND DISCUSSION

Demographics

Survey respondents totaled 885, with 762 having fruit/vegetable gardening experience, 54 with no gardening experience and 69 with missing questionnaire information. Table 1 shows the demographic characteristics of respondents with gardening experience. The majority were older, with 89% age 40 or older, lived in a small town or suburban area (85%), and were highly educated (75% with some college or more). Income was fairly equally distributed above and below $50,000 per year. The relative population distribution was as expected, with Connecticut having the largest portion of respondents. The years of gardening experience averaged 22 ± 15, with the majority of respondents indicating 1–20 years of gardening experience. When asked to identify sources of gardening information, respondents indicated that major sources of gardening knowledge were family/friends, printed information and/or other media.

Knowledge and attitude response

The results of the 56 knowledge questions by timeline and content categories, ranked in order from low to high and by mean, are shown in Tables 2 and 3, respectively. Shaded scores in Table 2 indicate the percent correct answers. The rank ordering of all questions showed that responses to only 23 of the 56 items (41%) met the 80% standard. Topics associated with low scores concerned the safety of organically grown produce, association of produce with pathogenic bacteria, use of manure and compost, issues associated with water safety, washing produce and home canning. Mean percent correct ranged from 61% to 71% for timeline and 59% to 74% for content areas. Prior to planting/soil preparation, planting/growing, foodborne illness, compost/manure and water safety all had 75% of the category survey items answered incorrectly. Although prior to planting, water safety and compost/manure application had the lowest mean scores, no category area or total knowledge assessments reached the 80% mastery level. High knowledge (80% – 89% subject mastery, n = 83) and low knowledge (23% – 50% subject mastery, n = 71) respondents represented 11% and 9% of the survey population, respectively. Individuals with high knowledge from garden to table, had significantly higher ($P < 0.05$) income. These respondents also depended less on family members for gardening information, acquiring significantly more ($P < 0.05$) information from newspapers, the Internet, university/extension and gardening centers. This group also had a trend toward a higher education level.

The total attitude score, 4.04 ± .53 (Table 4), with an alpha reliability of 0.75, illustrated that the respondents were generally supportive of proper home gardening practices. Consumers felt that their gardening practices were important to the safety of the fruits and vegetables they grew and harvested in their gardens, with 86% – 97% of the respondents either agreeing or strongly agreeing with attitude statements relating to home gardening practices. However, there was less agreement (undecided or disagreement) with those statements that compared safety of home-grown product to that of products from commercial growers or markets/grocery stores. It appeared that gardeners not only considered home grown food safer than produce found in markets or grocery stores, but also perceive that their responsibility for produc-

TABLE 2. Survey knowledge question responses in ranked order within safety categories from low to high by correct answers (n = 762)

Survey Questions by Category	Disagree	Agree	Don't Know
	Mean (%)*		
General Fruit and Vegetable Safety			
Organically grown produce is less likely to cause foodborne illness then conventionally grown produce.	**41***	39	20
Outbreaks of foodborne illnesses associated with eating raw fruits and vegetables have been increasing.	19	**44**	37
Fruits and vegetables contain many bacteria that can affect quality but do not cause illness.	32	**52**	16
Foodborne illnesses commonly occur from improper food handling in the home.	9	**83**	8
It can take only a small number of harmful bacteria to make a person sick.	8	**83**	9
Disease-causing bacteria can be found on fruits and vegetables.	5	**84**	11
It is important to wash your hands before handling fruits and vegetables.	9	**88**	3
It is important to wash your hands before and after harvesting.	6	**91**	3
Prior to Planting/Soil Preparation			
The temperature of compost should be 100°F (38°C) for at least 3 days.	**8**	26	66
Produce grown in soil that has been treated with fresh manure in the spring should not be harvested for at least four (4) months.	19	**36**	45
When manure is properly composted, harmful bacteria are destroyed.	17	**50**	33
If fresh animal manure is used as fertilizer at the beginning of the growing season, it should be applied 2 weeks prior to planting and incorporated into the soil.	11	**56**	33
Gardeners should regularly check the temperature of their compost.	11	**57**	32
Soil contains bacteria that can cause foodborne illness.	15	**59**	26
Fresh animal manure is best applied after the growing season to prepare the soil for next year.	11	**67**	22
Animal manure (e.g., cow, goat, horse, chicken, and pig) can be used for composting.	21	**69**	10
Fresh animal manure can be applied to the garden at anytime during the growing season.	**71**	11	18
The growth of bacteria is needed in a compost bin for decomposition and "rich" compost.	3	**81**	16
It is necessary to "turn" or "stir" a compost pile.	8	**85**	7
Cat or dog feces can be added to the compost pile.	**90**	4	6
During Planting/Growing			
Organic gardening practices make home-grown produce safer to eat.	**21**	63	16
All outside faucets used to water the garden should have a back-flow protector.	19	**38**	43
Well water is safer for gardening than municipal or city water.	**51**	23	26
Water can be a source of disease-causing bacteria that can contaminate produce.	24	**59**	17
It is important to change clothes after working in the garden.	25	**63**	12
Certain produce can get contaminated through the roots by contaminated water.	11	**65**	24
Fertilizing with fresh manure during the growing season should be encouraged to help plants grow.	**65**	13	22

TABLE 2. Survey knowledge question responses in ranked order within safety categories from low to high by correct answers (n =762) (con't)

Survey Questions by Category	Disagree	Agree	Don't Know
		Mean (%)*	
The only reason to limit access of animals to the garden is to prevent the produce from being eaten or destroyed.	**74**	21	5
The best time to water a garden is first thing in the morning.	16	**81**	3
It is important to keep the area around the garden mowed and cleared to keep pests and rodents away.	6	**86**	8
It is important to change clothes after applying fertilizer in the garden.	5	**91**	4
Harvesting			
It is okay to harvest fruits or vegetables from the garden when you are feeling ill.	**44**	31	25
Damaged or bruised produce is more likely to cause foodborne illness.	22	**60**	18
If you have a cut or a sore on your hands, wear clean gloves when harvesting to protect fruit and vegetables.	11	**82**	7
Clean containers should be used when harvesting produce.	4	**95**	1
Post Harvesting Handling			
Home canned string beans are safe to eat if they were processed by the hot water bath (boiling water) method.	**14**	50	36
It is safe to use diluted chlorine bleach solution, followed by a rinse, to clean produce.	35	**34**	31
Very cold water should be used to wash warm, fresh picked produce to get it cold.	**40**	24	36
Washing produce from the garden with soap and water will help keep it safe to eat.	**42**	40	18
Disease-causing bacteria cannot get inside fruits and vegetables that have peels, rinds or skins.	**60**	16	24
After cutting raw meat or chicken, wipe off the cutting board surface with a wet dishcloth or sponge before using the board to cut produce.	**68**	31	1
Freezing home grown vegetables will keep them safe to eat.	16	**68**	16
Home canned fruits or vegetables are only safe it they are processed using scientifically tested/approved methods.	16	**70**	14
Disease-causing bacteria can survive and/or grow at refrigerator temperatures.	13	**72**	15
It is safe to eat produce as you pick it.	**74**	20	6
The temperature of a home refrigerator should be 40°F or below.	6	**81**	13
After brushing off surface dirt, wash the outer melon skin or rind, even though it is not eaten.	10	**83**	7
Use a brush and water to clean fruits and vegetables that have a firm surface.	10	**84**	6
Washed vegetables should be dried with a clean cloth or paper towel before storage.	9	**84**	7
Fruits and vegetables should be washed in clean drinking water before eating.	8	**87**	5
Post Harvest Handling			
It is okay to store fresh produce in the refrigerator next to or below raw meat and poultry.	**88**	7	5

TABLE 2. Survey knowledge question responses in ranked order within safety categories from low to high by correct answers (n =762) *(con't)*

Survey Questions by Category	Disagree	Agree Mean (%)*	Don't Know
Perishable fresh produce from the garden should be stored in a refrigerator after washing.	9	**88**	3
Fruits and vegetables may become contaminated with harmful bacteria from my kitchen during handling and storage.	5	**91**	4
One should clean the sink before washing fruits and vegetables.	6	**92**	2
It is okay to use the "every day" kitchen sponge to wash dirty produce right out of the garden.	**96**	2	2

***Bolded scores indicate percent correct answers.**

ing safe fruits and vegetables was not the same as that of a commercial grower. This may be due to the fact that the commercial producer would be perceived as serving the larger public. Although the reliability was good, the relationship between attitude and knowledge was lower than expected (r = 0.23). The respondents appeared to have a positive attitude toward fruit and vegetable safety information, they did not appear to have the knowledge or reasoning to actually support their attitude. Knowledge timeline and content category reliability scores were lower then desired; therefore, mean scores (Table 3) should be viewed as trends with emphasis on the descriptive rather then statistical attributes of the respondents. These categories were "multi-faceted," resulting in questions that crossed over different food safety areas with varying degrees of difficulty. The variation in difficulty and item content appears to have resulted in lower reliability scores. The content category, which contained questions of more similarity, had higher reliability scores than scores for questions in the timeline dimension, where questions were more diverse. However, the total knowledge score had an acceptable Cronbach's alpha of 0.78, which could be used for further statistical assessment.

Table 5 compares the total knowledge responses to the demographic categories. Significantly ($P < 0.01$) higher garden to table gardening knowledge was found with higher income, gardening versus lack of gardening experience and Master Gardener program participation. State of residence, age, education level, gender and living area did not appear to have significant impact on total fruit/vegetable safety gardening knowledge. Gardening experience (Table 6), income (Table 7) and Master Gardener (Table 8) demographics had significant impact ($P < 0.01$) not only on total knowledge but on specific categories assessed by this survey. While it would be expected that individuals without home fruit and vegetable gardens would have relatively little knowledge of actual gardening practices, it is important to note that gardening experience also appeared to have an impact on knowledge of general fruit and vegetable safety and of post-harvest handling, both of which are important whether the produce comes from a private garden or a supermarket. The experienced and non-experienced respondents scored differently in the prior to planting/soil preparation, during planting/growing, foodborne illness, post-harvest handling and compost/manure application areas. Trends for the other demographic categories showed deficiencies in the same categories. As expected, trends showed that Master Gardeners scored higher in just about every category as well as total knowledge. While the impact of these demographics may indicate higher food safety awareness for some home gardeners, the mean scores for *all categories* and *total knowledge* were still much lower than the desired 80% mastery standard.

CONCLUSION

Regardless of the subtle differences found by this survey knowledge of food safety of fresh fruits and vegetables, by New England home gardeners, all knowledge levels assessed fell below the 80% subject mastery. More than 50% of the survey questions addressing aspects of general fruit/vegetable safety, gardening practices and post-harvest handling were either answered incorrectly or were answered by an indication that the respondent did not know the answer. Therefore, the results of this survey strongly indicate a lack of food safety knowledge among New England home gardeners and support the need for outreach programming and training.

These findings will be used to develop an outreach program for food safety from garden to table. Resources will be developed and delivered through Master Gardener programs and its volunteer network that exist within the New England Land Grant Universities. This is an ideal approach for conducting this food safety education, since the Master Gardener program has been established in the majority of states as part of the Land Grant University-sponsored Cooperative Extension outreach efforts to address the needs of the home gardener. Utilizing the Good Agricultural Practices framework, emphasis of the education program will be on those specific areas of knowledge that fell short of subject mastery. In addition, efforts will be made to place educational materials in those venues that this survey indicated were key sources for gardening information by home gardeners. Further research will include on-site, structured interviews and observations with home gardeners to probe the topics associated with especially low knowledge scores to determine areas of misunderstanding and lack of knowledge.

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TABLE 3. Mean scores (%) for home gardener survey in timeline and content categories

Category	Mean % Correct	Survey Questions range (%)	Survey Questions *below* mastery*	Total Questions
Timeline				
General Fruit and Vegetable Food Safety	71 ± 17	41 – 91	37.5%	8
Prior to Planting/Soil Preparation	61 ± 18	8 – 90	75%	12
During Planting and Growing	63 ± 18	21 – 91	75%	12
Harvest	70 ± 25	44 – 95	50%	4
Post Harvest Handling	69 ± 12	14 – 96	50%	20
Content				
Foodborne Illness	68 ± 14	14 – 91	62%	21
Sanitation/Hygiene	74 ± 14	34 – 96	39%	18
Compost or Manure	61 ± 19	8 – 90	75%	12
Water Safety	59 ± 24	38 – 81	75%	4
Total Knowledge	73 ± 12	8 – 96	59%	56

*Minimum subject mastery @ 80%.

TABLE 4. Comparison of knowledge and attitude reliability within timeline and content categories

Knowledge category	Knowledge reliability*	Knowledge correlation with total attitude**
Timeline		
General Food Safety	0.34	0.13
Prior to Planting/Soil Preparation	0.57	0.08
During Planting and Growing	0.52	0.22
Harvest	0.43	0.23
Post Harvest Handling	0.48	0.18
Content		
Foodborne Illness	0.60	0.21
Sanitation/Hygiene	0.58	0.20
Compost or Manure	0.63	0.05
Water Safety	0.32	0.19
Total Knowledge	0.78	0.23

*Cronbach's alpha internal consistancy of reliability.

**Reliability total attitude = 0.75, total attitude score 4.04 ± 0.53.

TABLE 5. Comparison of total knowledge responses in the home gardening survey to demographic categories

Demographic Categories	Number of Respondents	Mean Percent Correct*
Gardening Experience (years)		
0	54	59 ± 15[a]
1–10	241	65 ± 12[b]
11–29	271	69 ± 11[b]
30+	250	68 ± 12[b]
State of Residence**		
Connecticut	347	67 ± 25
Maine	168	68 ± 24
New Hampshire	111	67 ± 24
Rhode Island	78	68 ± 28
Vermont	57	69 ± 28
Age (years)**		
Under 39	82	67 ± 11
40 – 59	367	67 ± 12
Over 60	312	68 ± 12
Income (dollars)**		
≤ 29,999	140	65 ± 12[a]
30,000 ≤ 49,999	170	67 ± 13[ab]
50,000 ≤ 69,999	159	67 ± 11[ab]
> 70,000	230	69 ± 11[b]
Education**		
≤ 9th to some high school	32	62 ± 14
High school or GED	160	68 ± 12
College to some graduate	423	68 ± 12
Post graduate	144	67 ± 11
Gender**		
Male	294	67 ± 12
Female	396	68 ± 11
Master Gardener**		
Completed	18	74 ± 14[a]
No Program	742	67 ± 12[b]
Living Area **		
Rural	63	69 ± 12
Small Town	317	67 ± 12
Suburban	323	68 ± 11
City	55	65 ± 9

*Figures with different letters (a,b) ***within*** categories are significantly different @ $P < 0.01$.

**Does not include those with no gardening experience.

TABLE 6. Comparison of knowledge responses in home gardening survey to gardening experience

Category	Number of years of gardening			
	0 (N=54)	1–10 (N=241)	11–29 (N=271)	30+ (N=250)
Timeline	Mean % Correct*			
General Food Safety	63 ± 19[a]	69 ± 17[ab]	72 ± 16[b]	71 ± 18[b]
Prior to Planting/Soil Preparation	47 ± 22[a]	57 ± 19[b]	63 ± 17[c]	63 ± 18[c]
During Planting and Growing	54 ± 20[a]	61 ± 17[ab]	64 ± 17[b]	63 ± 19[b]
Harvest	63 ± 28[a]	69 ± 24[a]	71 ± 26[a]	71 ± 25[a]
Post Harvest Handling	65 ± 16[a]	71 ± 13[ab]	73 ± 11[b]	74 ± 12[b]
Content				
Foodborne Illness	58 ± 19[a]	64 ± 14[b]	69 ± 13[b]	69 ± 15[b]
Sanitation/Hygiene	69 ± 15[a]	74 ± 14[a]	74 ± 14[a]	73 ± 15[a]
Compost or Manure	47 ± 23[a]	56 ± 20[a]	63 ± 18[b]	64 ± 19[b]
Water Safety	50 ± 26[a]	57 ± 22[a]	61 ± 25[a]	58 ± 26[a]
Total Knowledge	59 ± 15[a]	65 ± 12[b]	69 ± 11[b]	68 ± 12[b]

*Minimum subject mastery @ 80%.

Figures with different letters ***within*** rows are significantly different @ $P < 0.01$.

TABLE 7. Comparison of knowledge responses in the home gardening survey to income demographic

Category	Income (dollars)			
	≤ 29,999 (N=140)	30,000 ≤ 49,999 (N=170)	50,000 ≤ 69,999 (N=159)	>70,000 (N=230)
Timeline	Mean % correct*			
General Food Safety	67 ± 19[a]	70 ± 17[ab]	72 ± 16[ab]	73 ± 17[b]
Prior to Planting/Soil Preparation	62 ± 19[a]	60 ± 18[a]	60 ± 18[a]	62 ± 18[a]
During Planting and Growing	56 ± 19[a]	61 ± 18[ab]	64 ± 17[b]	67 ± 17[b]
Harvest	70 ± 25[a]	72 ± 23[a]	69 ± 26[a]	70 ± 26[a]
Post Harvest Handling	71 ± 13[a]	71 ± 14[a]	72 ± 12[a]	74 ± 12[a]
Content				
Foodborne Illness	63 ± 15[a]	66 ± 15[ab]	69 ± 12[b]	70 ± 14[b]
Sanitation/Hygiene	72 ± 14[a]	74 ± 15[a]	72 ±14 [a]	75 ± 13[a]
Compost or Manure	62 ± 20[a]	60 ± 19[a]	60 ± 19[a]	62 ± 19[a]
Water	50 ± 25[a]	57 ± 24[ab]	61 ± 24[b]	65 ± 23[bc]
Total Knowledge	65 ± 12[a]	67 ± 13[ab]	67 ± 11[ab]	69 ± 11[b]

*Minimum subject mastery @ 80%.

Figures with different letters (a,b,c) ***within*** rows are significantly different @ $P < 0.01$.

TABLE 8. Comparison of knowledge responses in home gardening survey to participation in Master Gardener programs

Category	Completed Master Gardener program (N=18)	No program (N=742)
Timeline	Mean % Correct*	
General Food Safety	75 ± 17[a]	71 ± 17[a]
Prior to Planting/Soil Preparation	72 ± 18[a]	61 ± 18[b]
During Planting and Growing	68 ± 22[a]	63 ± 18[a]
Harvest	71 ± 26[a]	70 ± 25[a]
Post Harvest Handling	79 ± 11[a]	72 ± 12[b]
Content		
Foodborne Illness	74 ± 14[a]	67 ± 14[a]
Sanitation/Hygiene	77 ± 13[a]	74 ± 14[a]
Compost or Manure	74 ± 19[a]	61 ± 19[b]
Water Safety	67 ± 26[a]	59 ± 24[a]
Total Knowledge	74 ± 14[a]	67 ± 12[b]

*Minimum subject mastery @ 80%.

Figures with different letters (a,b) ***within*** rows are significantly different @ $P < 0.01$.

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CONGRATULATIONS!

In March 2006, the International Association for Food Protection participated at Food Safety World in Washington, D.C. While exhibiting, we offered a drawing for a one-year Membership with our Association and a free registration to our Annual Meeting. We are pleased to announce the following winners of the drawing:

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International Association for Food Protection

Top Ten Food Safety Problems in the United States Food Processing Industry

AYLIN SERTKAYA,[1]* AYESHA BERLIND,[1] RACHEL LANGE,[2] and DONALD L. ZINK[2]
[1]Eastern Research Group, Inc. (ERG), 110 Hartwell Ave., Lexington, MA 02421, USA; [2]FDA, Center for Food Safety and Applied Nutrition (CFSAN), 5100 Paint Branch Pkwy., College Park, MD 20740, USA

SUMMARY

The preventive controls are less rigorous at some food processing facilities than at others, potentially increasing the risk of microbiological, chemical, and physical food safety hazards. We used a modified three-round Delphi technique to generate expert opinion on the ten food safety problems that are of top concern for the food processing industry today, and the preventive controls needed to address them. The expert panel members evaluated the frequency and severity of the food safety risk posed for five food processing industry sectors (baked, dairy, frozen, refrigerated, and shelf-stable goods, excluding meat and poultry products) and three plant sizes for each of the ten most important problems identified. The experts collectively ranked "deficient employee training" as the top problem facing food processors today, followed by "poor plant and equipment sanitation" and "contamination of raw materials." Other problems included "poor plant design and construction," "post-process contamination," "difficult-to-clean equipment," and "incorrect labeling and packaging." The expert panel also made recommendations on the types of preventive controls needed to address these problems. Some of the main recommendations with broad applicability across all food sectors included ongoing and targeted training of employees, management, and suppliers; periodic audits of facility and raw material suppliers; improved recordkeeping; and validation/evaluation of activities such as employee training and cleaning procedures.

INTRODUCTION

Food safety is paramount to food processing. Although the food processing industry has made big strides in enhancing the safety of foods manufactured, the food safety literature indicates that there remains room for further improvements in microbiological, chemical, and physical safety at food processing plants. Published reports indicate that some food processing plants continue to struggle with such food safety challenges as poor hygienic practices *(5)*, ineffective employee training *(1)*, deficient cleaning and sanitation of equipment and utensils *(3, 10)*, raw material contamination *(8, 11)*, and ineffective allergen control *(2, 4)*, among others. Further, evolution of new agents as well as new vehicles transmitting known pathogens, increased reliance on food imports, adoption of more sophisticated food production and processing technologies, and increased automation make prevention of food contamination a moving target for food processors *(9)*.

The majority of these problems can be remedied with basic common sense preventive controls, such as targeted employee training, monitoring of cleaning and sanitation effectiveness via environmental sampling and testing, and implementation of raw material supplier qualification and monitoring programs. Others are more difficult to control, such as post-processing contamination with *Listeria monocytogenes*, a pathogen that is ubiquitous in the processing environment.

A peer-reviewed article

*Author for correspondence: Phone: 781.674.7227; Fax: 781.674.2851
E-mail: aylin.sertkaya@erg.com

TABLE 1. Risk scoring grid for general and allergen risks

	Severity	
Frequency	**High**	**Low**
High	4	2
Low	3	1

Preventive controls also vary in cost, and given limited budgets, food processors may benefit from adopting a risk-based approach to prioritizing their food safety initiatives based on a risk-payoff analysis. For example, problems that pose the highest risk to food safety but are least costly to fix can be addressed earlier than those with low risk but high costs. This study is designed to provide a global perspective on the state of food manufacturing in the United States, with the goal of aiding regulators and food processors in developing such an analysis.

The objectives of this study were twofold: (1) To identify the main problems that pose microbiological (i.e., pathogenic bacteria, viruses, and parasites), chemical (i.e., allergens, cleaners and solvents, and mycotoxins), and/or physical (i.e., foreign objects such as glass and metal) safety hazards to food at the processor level, and (2) to determine the preventive controls that food manufacturers should implement to address each of the problems identified.

MATERIALS AND METHODS

The study objectives required gathering current data that are not accurately known and that did not easily lend themselves to highly precise analytical techniques, such as a statistical industry survey, which would entail asking manufacturers to release potentially sensitive information. Thus, we used a modified Delphi technique to generate the necessary information from a panel of nationally recognized experts in food safety. The Delphi technique involves eliciting opinions of experts on a collective basis and is widely applied in the forecasting and policy arenas *(6, 7)*. A successful application of the technique requires assembling a panel, preferably consisting of 15 or more individuals who are considered experts in the given field of investigation, although some Delphi studies have been conducted with a panel consisting of as few as four experts.

Study design

We assembled a 15-member panel comprising nationally recognized experts in food safety, HACCP, food plant sanitation, quality systems, process optimization, GMP compliance, and food microbiology. On average, the panel members possessed over 30 years of food industry experience in various sectors, such as canned foods, fresh produce, meat and poultry products, and seafood. In identifying the experts, we relied on recommendations from FDA, various food industry personnel, and other experts in food safety.

The study utilized a three-round design. In Round 1, we provided each panel member with a list of food safety problems previously identified through a literature review and discussions with selected expert panel members. We then asked each panel member to: (1) indicate the major food sectors, including baked, dairy, frozen, refrigerated, and shelf-stable, to which the listed problem is mainly applicable, (2) add to the list of food safety problems if necessary, and (3) select the ten most important food safety problems facing food manufacturers today, based on their frequency and severity.

The objective of Round 2 was to determine whether each of the top ten problems identified in Round 1 posed a sufficiently different food safety risk for a particular food item (e.g., pies) within a major food category (e.g., baked goods) than for the major food category as a whole. Thus, we asked each panel member to indicate whether a separate risk score is more appropriate for a listed food item within a major food category for each of the ten food safety problems. To ensure consistency of responses in the identification of food items, a list of product categories (obtained from Information Resources, Inc. (IRI) InfoScan® Custom Store Tracking database) was included for each major food sector.

Round 3 involved assessing the risk posed by each of the top ten food safety problems identified by major food sector (baked, dairy, frozen, refrigerated, and shelf-stable) and facility size (small, medium, and large). Additionally, we asked each expert to determine the types of preventive controls necessary to address each of the top ten problems identified. More specifically, experts were asked to assign a "general" as well as an "allergen" risk score from 1 to 4, Table 1, based on the problem's frequency and severity by food sector and facility size. "General" risk score had to reflect the risk of the food safety problem with respect to all hazards (i.e., microbiological, physical, and chemical) except for allergens, and "Allergen" score had to reflect the risk of the food safety problem with respect to allergens only.

We also asked each expert to indicate the types of preventive controls that food processors need to implement to address each of the ten food safety problems by facility size and major food sector. Although large food processors might have the capital to invest in more sophisticated technologies, small processors are likely to face resource constraints that make such technologies infeasible. Therefore, the expert panel was instructed to take account of cost-effectiveness when making recommendations on the types of controls by size of food processor and main food sector (i.e., baked goods, dairy, frozen, refrigerated, and shelf-stable). Given the large number of food items identified for risk scoring in round 2, we asked experts to provide preventive control recommendations for only the main food sectors and to note any additional controls that might be needed for a subcategory.

Data analysis

We used STATA to perform descriptive univariate analysis as well as factor analysis on the data collected. We used STATA's *factor*, *greigen*, *rotate*, and *score* functions for factor analysis, a data reduction technique that reduces the number of variables used in an analysis by creating new variables (called factors) that combine redundancy in the data. A factor analysis looks for correlations among the variables, and the first step is to determine the number of relevant factors. Although STATA's algorithms used to solve factor analyses include methods of determining an appropriate number of factors, it is also possible to specify (fix) the number of factors in the analysis. For this study, we both allowed the algorithms to determine the number of factors and used judgment in determining the appropriate number of factors. The output from the factor analysis generates a table that relates each variable to each factor and assigns a numerical value between –1 and 1 to each relationship. The numerical values, referred to as factor loadings, reflect the strength of the relationship between the

TABLE 2. Ranking of food safety problems by number of votes across all food sectors

Food Safety Problem	Votes	
	Number	Percentage
Deficient employee training	15	(94%)
Contamination of raw materials	12	(75%)
Poor plant and equipment sanitation	12	(75%)
Poor plant design and construction	12	(75%)
No preventive maintenance	11	(69%)
Difficult-to-clean equipment	10	(63%)
Post-process contamination at manufacturing plant	10	(63%)
Contamination during processing	9	(56%)
Poor employee hygiene	9	(56%)
Incorrect labeling or packaging	7	(44%)
Contamination by reworked product	5	(31%)
Inadequate cooling	5	(31%)
Biofilms	4	(25%)
Lack of equipment knowledge	4	(25%)
Poor pest control	4	(25%)
Stagnant water due to dead ends in plumbing	4	(25%)
Condensate on pipes and other equipment	3	(19%)
Lack of crisis management protocol	3	(19%)
Lack of knowledge of welding standards	2	(13%)
Lack of product recovery protocol	2	(13%)
Lack of allergen control programs	1	(6%)
Lack of equipment parts reconciliation after repairs	1	(6%)
Use of unpotable water	1	(6%)

factors and the variables. Variables that are closely related to one another should all load highly on the same factor.

The method allowed us to generate an overall risk score that combines the information in all of the ten problems, as well as four factor risk scores by sector.

RESULTS

Descriptive analysis

Analysis of Round 1 data shows that "refrigerated products" is the one sector to which the majority of food safety problems are applicable. Additionally, although some problems, such as "deficient employee training," "poor plant and equipment sanitation," "contamination of raw materials," and "poor plant design and construction," are applicable to all food sectors, other problems, such as "biofilms" and "condensate on pipes and other equipment," are more sector-specific. The relative importance of a given food safety problem (measured by the number of votes received) varies from sector to sector. However, we find that those problems with broad applicability across all sectors ("deficient employee training," "contamination of raw materials," "poor plant and equipment sanitation," and "poor plant design and construction") also rank highest in the top-ten food safety problems list (Table 2).

Examination of Round 2 responses shows that the number of food items selected across the food sectors for scoring in the subsequent round is lowest for shelf-stable foods. The refrigerated, frozen, and dairy sectors have the highest number of food items selected. Overall, given the different areas of expertise of individual panel members, a large number of food items within each food sector were identified as meriting a separate risk score. The total number of categories for the panel members to score (for "general" as well as "allergen" risks) by facility size ranges from 70 to over 100 across the ten food safety problems, substantially increasing the respondent burden in the third round.

The risk score data in Round 3 shows that small and medium-sized facilities tend to have higher general and allergen risk scores than large facilities across all problems and food sectors. The food safety problems with the highest general risk scores include "deficient employee train-

TABLE 3. Overall risk scores and factor risk scores by sector, general risk category

Risk Factors	Baked Goods	Dairy	Food Sectors Frozen	Refrigerated	Shelf-Stable
Overall risk	-0.058	0.837	0.232	1.098	-0.513
Process-related contamination [a]	-0.376	0.665	0.128	0.518	-0.249
Equipment [b]	-0.084	0.254	0.259	0.848	-0.375
Quality control [c]	-0.037	0.670	-0.087	0.182	-0.102
Input-related contamination [d]	0.542	0.078	0.206	0.668	-0.333

[a] The process-related contamination risk factor loads highly on "contamination during processing," "contamination of raw materials," and "poor employee hygiene."[b] The equipment risk factor loads highly on "poor plant design and construction," "difficult-to-clean equipment," and "poor plant and equipment sanitation."[c] The quality control risk factor loads highly on "post-process contamination at plant," "no preventative maintenance," and "deficient employee training."[d] The input-related contamination risk factor loads highly on "poor employee hygiene," "difficult-to-clean equipment," and "contamination of raw materials."

ing," "poor plant and equipment sanitation," "difficult-to-clean equipment," "poor employee hygiene," and "contamination of raw materials." The majority of these problems have also been identified as having broad applicability across sectors in the initial Delphi round. The problems with the highest allergen scores are "incorrect labeling or packaging," followed by "deficient employee training" and "difficult-to-clean equipment."

Factor analysis

Given the degree of overlap among various food safety problems, we expect that some underlying factors (i.e., root causes), which are smaller than the number of variables (i.e., number of food safety problems), are mainly responsible for the covariance among our variables. Therefore, we performed a factor analysis to determine the number of underlying dimensions in the risk score data collected. For the analysis, we separated the general risk scores from the allergen risk scores. Next, for each of the ten risk problems, we calculated an average risk score for each food item, taking the average of the experts' scores. This reduced the data to fewer observations for both the general and allergen risk categories, with a total of ten variables (i.e., the average risk scores for each problem). We then performed a factor analysis on these two datasets (general and allergen risks) to determine how the information contained in the ten risk problems could be combined to provide summary information.

One-factor analysis allowed us to generate an overall risk score that combined the information in all ten problems. Next, we performed a second set of factor analyses and determined that both general and allergen risks are best described by a four-factor model. That is, the ten variables can best be described by four underlying factors. This does not imply that each variable is assigned to a specific factor. Variables can (and will) be related to more than one factor. The four factors, differed slightly however, between the general and allergen categories. We named the four factors in the general category (1) process-related contamination risk, (2) equipment risk, (3) quality control risk, and (4) input-related risk. Similarly, the four factors in the allergen category were named (1) in-process contamination risk, (2) quality control risk, (3) other contamination risk, and (4) equipment risk. The names of factors were derived from those variables that contributed the most to the factor values and were subjective. For example, the "process-related contamination risk" factor got its name from the fact that the variables that contribute the most to it were "contamination during processing," "contamination of raw materials," and "poor employee hygiene."

Tables 3 and 4 summarize the factor analysis results for general and allergen risk score data, respectively. One way to see the information in Tables 3 and 4 is as two sets of risk summaries. The four factors aggregate the information from the ten risk problems to four summary measures, whereas the overall risk factor summarizes the four risk factors, or the ten risk problems, into one measure for each sector. The data on the ten risk problems generate a broad picture of the problems in each sector. The one- and four-factor models, however, account for correlations among the ten risk problem scores to generate summary measures.

As far as general food safety risks are concerned (Table 3), the study shows that the refrigerated products sector has the highest overall risk (1.098), followed by the dairy products sector (0.837). The shelf-stable and baked goods sectors, on the other hand, pose lower than average general food safety risks. Process-related contamination and quality control risks are highest in the dairy products sector, whereas equipment and input-related contamination risks are elevated in the refrigerated products sector. When allergen risks are considered (Table 4), refrigerated products have the highest overall risk (0.975) followed by baked goods (0.707). Further, the in-process contamination and equipment risks are the highest in the refrigerated products sector. Baked goods and frozen products sectors pose the highest risk with respect to quality control and other contamination, respectively.

Analysis of expert panel responses to the second part of Round 3 reveals that there is a range of preventive controls that could effectively address most of the food safety problems faced by the food processing industry today. Although the list of preventive controls recommended to address each food safety problem is extensive, some of the recurring themes across all sectors and food safety problems include:

TABLE 4. Overall risk scores and factor risk scores by sector, allergen risk category

Risk Factors	Baked Goods	Dairy	Food Sectors Frozen	Refrigerated	Shelf-Stable
Overall risk	0.707	0.107	0.453	0.975	-0.527
In-process contamination [a]	0.197	-0.102	0.250	0.551	-0.261
Quality control [b]	0.434	0.391	0.228	0.364	-0.269
Other contamination [c]	-0.007	0.017	0.301	0.272	-0.184
Equipment [d]	0.470	-0.005	0.222	0.756	-0.351

[a] The in-process risk factor loads very highly on "contamination during processing," and moderately high on "incorrect labeling or packaging."[b] The quality control risk factor loads highly on "no preventative maintenance," "deficient employee training," and "post-process contamination at plant."[c] The other contamination risk factor loads highly on "contamination or raw materials" and "poor employee hygiene."[d] The equipment risk factor loads highly on "poor plant design and construction," "poor plant and equipment sanitation," and "difficult-to-clean equipment."

- *Training* - Ongoing and targeted training on issues such as allergen control, cleaning and sanitation procedures, incoming ingredient receipt protocol, and monitoring; training of employees, management, and suppliers,
- *Audits* - Periodic audits and inspections of facility and raw material suppliers, either in-house or by third-party firms,
- *Documentation* - Documentation of training activities, raw material handling policies and activities, cleaning and sanitation, receiving records, and use of sign-off logs, and
- *Validation/evaluation* - Evaluation of training effectiveness and establishment of accountability; validation of cleaning through testing (e.g., swabs, organoleptic evaluations, and bioluminescence tests).

Other commonly noted problem-specific preventive controls were:

- Supplier audits and supplier certification programs for "raw material contamination" problems,
- Plant design reconfiguration and use of outside consultants for plant design, better sanitation, and improved flow and access to equipment for "poor plant design and construction" problems,
- Sanitation standard operating procedures (SSOPs) and environmental sampling and other monitoring for "difficult-to-clean equipment" problems,
- Use of preventive maintenance programs and documentation for deficiencies in preventive maintenance and assignment of accountability for "contamination during processing" problems,
- Environmental sampling, proper implementation of SSOPs, institution of HACCP, and product and process flow controls for "post-process contamination problems," and
- Label review and verification for "incorrect labeling or packaging" problems.

DISCUSSION

The study provides a global perspective on safety problems in the food manufacturing industry as well as information on the relative importance of these problems across various food sectors and firm sizes. Our findings indicate that the following are the top ten problems faced by food manufacturers today, in order of decreasing importance:

- Deficient employee training
- Contamination of raw materials
- Poor plant and equipment sanitation
- Poor plant design and construction
- No preventive maintenance,
- Difficult to clean equipment
- Post-process contamination at manufacturing plant
- Contamination during processing
- Poor employee hygiene
- Incorrect labeling and packaging.

Not surprisingly, these are also the most frequently mentioned problems in the food safety literature.

Although refrigerated and dairy foods have the highest general risk of food safety problems compared to other food categories, baked and refrigerated foods pose the highest risk in terms of allergen hazards. Additionally, the study shows that the extent of these problems at small and medium-sized manufacturers likely varies from that at larger processors, with smaller facilities generating higher general and allergen risk scores than large facilities across all food safety problems and sectors.

The expert panel agrees that the majority of food safety problems identified could be addressed with better training of employees; regular third-party or in-house audits of food facility operations; improved recordkeeping, especially documentation of training activities, HACCP, and SSOPs; and validation/evaluation of activities such as cleaning and training effectiveness. Although the risk scores vary by food sector and facility size, the study shows that the preventive controls for addressing the food safety problems do not.

The study findings may have implications for food policy in general. As regulators are increasingly embracing a more risk-based approach to setting priorities and allocating resources for food safety, the results of this study can help focus their efforts. For example, results from the study indicate that training is a key component of preventing foodborne hazards in food processing plants. One area that

policymakers may therefore want to explore further is the role of government in improving employee training.

Our findings may also aid food processors in prioritizing their in-plant food safety initiatives. The study helps clarify which food safety problems are most likely to occur in food processing plants, taking into account sector-specific challenges. This ranking can help food processors understand what processes in their plant pose the greatest risk in terms of food contamination. Furthermore, the study provides information on the most effective preventive controls available to increase the safety of the food that they produce. Given the limited budgets of food processors, these data might help them to determine where they should focus their spending to ensure that the foods that they produce are safe.

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Go to page 343 to register.

NOTIFICATION OF PROPOSED AMENDMENTS TO THE INTERNATIONAL ASSOCIATION FOR FOOD PROTECTION CONSTITUTION AND BYLAWS

IAFP CONSTITUTION

Proposed changes to be voted on by the IAFP Membership present at the IAFP Annual Business Meeting on Tuesday, August 15, 2006 at 12:15 p.m. in Calgary, Alberta, Canada.

Proposed change #1

ARTICLE VI.
MEETINGS

A. Each year, IAFP shall hold an Annual Business Meeting.

1. A quorum, for any meeting to conduct business, shall consist of at least 50 voting members.
2. Robert's Rules of Order shall govern the procedures at all IAFP meetings except where otherwise provided for in the Constitution or Bylaws. ~~Voting by proxy shall not be permitted.~~

B. Other meetings of IAFP may be called by the Executive Board by duly announcing any called meeting in the official publication of IAFP at least 60 days prior to the date of the meeting.

C. In case a quorum is not present to transact necessary business, the Executive Board is authorized to act for the best interests of IAFP.

D. The Executive Board shall meet at each IAFP Annual Business Meeting and at such other times as the President deems necessary.

1. A quorum for Executive Board meetings shall consist of at least four members of the IAFP Executive Board and decisions shall be by a majority vote of those present.
2. In the event of a tie vote, the presiding officer will be permitted to vote.

E. When, in the discretion of the Executive Board, it is considered advisable to conduct a vote on a question by ~~mail~~ ballot, a majority of the votes cast will be necessary to carry the proposition.

Rational: To amend the Constitution to allow for electronic voting.

Proposed change #2

ARTICLE VII.
AMENDMENTS

A. Any member may propose amendments to the Constitution by submitting them in writing to the Executive Director, at least 60 days before the date of the next announced Annual Business Meeting.

1. The Executive Director shall notify all members, at least 30 days before the Annual Business Meeting that the proposed amendments will be open for discussion at that meeting.
2. Such proposed amendments, upon a majority affirmative vote of the members present shall, within 60 days, be submitted to the entire membership of IAFP by the Executive Director.
3. All members voting on such amendments shall, within 45 days after issuance of such notification, register their vote ~~in writing~~ with the Association office ~~Executive Director;~~ on ~~sealed~~ ballots furnished by IAFP.
4. These ballots shall be ~~opened by the Tellers Committee and counted and~~ certified to the IAFP President by the Chairperson of the Tellers Committee. The results shall be reported by the IAFP President to the membership.
5. If the proposed amendments are passed by a two-thirds vote of those members who register their votes with the Association office, ~~Executive Director,~~ they shall become a part of the Constitution from the date of such report and notice by the IAFP President.

Rational: To amend the Constitution to allow for electronic voting.

IAFP BYLAWS

Proposed changes to be voted on by the IAFP Membership present at the IAFP Annual Business Meeting on Tuesday, August 15, 2006 at 12:15 p.m. in Calgary, Alberta, Canada.

Proposed change #1

SECTION I.
MEMBERSHIP AND DUES

7. Any person, having once become a member, may continue membership in IAFP so long as the annual membership dues are paid, except as provided in Section II, subsection B8, of these Bylaws.

7.1 Any member who fails to pay annual due by due date shall be placed on the inactive list.

7.1.1 Members on the inactive list shall not be entitled to member entitlements and will not receive publications of IAFP.

7.1.2 Such member(s) may be reinstated within 90 days of their membership expiry date, upon payment of dues.

7.1.3 Any member who is delinquent in dues after 90 days will be removed from the inactive list.

7.1.3.1 Membership may be reestablished by filing an application and payment of annual dues.

7.1.3.2 Members rejoining after 90 days will be considered as new members and their anniversary date adjusted accordingly.

Rational: To clarify inactive Members are not entitled to receive Member entitlements.

Proposed change #2

SECTION I.
MEMBERSHIP AND DUES

8. Each member of IAFP ~~in good standing~~ shall receive ~~at no extra cost,~~ the regular issues of the Association's official publication ~~of IAFP and such other publications as the Executive Board may direct, for the period in which the dues are paid.~~ Other publications may be provided at additional cost.

Rational: To clarify publications received by each Member.

Proposed change #3

SECTION V.
PUBLICATIONS

A. All publications of IAFP will be issued under the authority of the Executive Board.

1. Any Affiliate Association may publish its own material but must assume full responsibility therefore, and not obligate IAFP in any manner.

B. The electronic newsletter shall be the official publication of IAFP for membership communication.

C. *Food Protection Trends* shall be the ~~official~~ applied technical publication of IAFP and the *Journal of Food Protection* will be the scientific research publication.

1. These Journals will be the property of IAFP, which will own the copyrights and all articles published therein.
2. The Executive Board will appoint Scientific Editors for *Food Protection Trends* and *Journal of Food Protection* to 4-year renewable terms and establish appropriate compensation.

Rational: This amendment adds the electronic newsletter as the official publication of IAFP. Upon approval, this allows the Association to revise its dues structure, adding a base Membership fee for those who want to only receive the electronic newsletter. Other language clarifies where Scientific Editors will be appointed.

Proposed change #4

SECTION VI.
STANDING COMMITTEES, SPECIAL COMMITTEES, PROFESSIONAL DEVELOPMENT GROUPS and TASK FORCES

B. Special Committees

1. Special Committees provide support services to IAFP on a continuous basis. Special Committees of IAFP shall consist of the following: 3-A Committee on Sanitary Procedures, Audiovisual Library, Awards, Black Pearl Selection, Committee on Control of Foodborne Illness, Constitution and Bylaws, Developing Scientist Award, Fellows Selection, Foundation ~~Fund~~, Membership, Nominating, Past Presidents', and Tellers.

1.9 Foundation ~~Fund~~ Committee

The Foundation ~~Fund~~ Committee shall consist of the President, President-Elect and Vice President of IAFP and a chairperson and vice chairperson recommended by the President-Elect for confirmation by the Executive Board. The chairperson and vice chairperson shall serve in such position for no more than two consecutive terms. The chairperson shall recommend other individuals to the President-Elect for confirmation by the Executive Board. Appointed membership (including the chairperson and vice chairperson) shall be balanced with equal representation from industry, government and education. All appointments shall be for 3-year renewable terms. The Foundation ~~Fund~~ Committee shall:

1.9.1 Oversee IAFP Foundation monies;

1.9.2 Solicit gifts to the Foundation; and

1.9.3 Identify and fund programs which further the goals and objectives of the Foundation and IAFP.

Rational: This amendment updates the name of the Foundation Committee and removes "Fund" from that name.

Proposed change #5

SECTION VI.
STANDING COMMITTEES, SPECIAL COMMITTEES, PROFESSIONAL DEVELOPMENT GROUPS and TASK FORCES

B. Special Committees

1.11 Nominating Committee

Each year prior to the Annual Meeting, the President-Elect shall appoint a chairperson and a vice chairperson for the Nominating Committee for the following year. The chairperson will submit the names of four to seven IAFP members to serve on the committee, to the Executive Board for confirmation.

1.11.1 At least one member shall have served on the Nominating Committee the previous year, and the members should be representative of geographical and membership groups.

1.11.2 The chairperson of the committee shall be announced at the Annual Meeting, and published in the official publication of IAFP following the Annual Meeting, together with the date by which candidates for nomination(s) for office(s) shall be submitted.

1.11.3 The Nominating Committee shall submit the names of at least two nominees for the office of Secretary to the Executive Director as directed by the President. The nominees' names, with pictures and biographical sketches, shall be published in the official publication of IAFP not later than April 1 of the year in which the election is to be held.

1.11.4 Ballots shall be provided ~~distributed~~ by the Executive Director as directed by the Executive Board and must be returned to the Association office Executive Director by the established deadline, for checking against the IAFP eligible voter list. The ballots are then forwarded to the Tellers Committee will oversee the election and certify the results for opening and counting.

1.11.5 Voting by proxy, or electronic voting, shall be permitted only in the election of the Secretary according to procedures established by the Executive Board.

1.11.~~5~~4.1 The nominee receiving the greatest number of votes shall be certified to the President, by the chairperson of the Tellers Committee, at least two months in advance of the Annual Meeting.

Rational: To amend the Bylaws to allow for electronic voting.

Proposed change #6

SECTION VI.
STANDING COMMITTEES, SPECIAL COMMITTEES, PROFESSIONAL DEVELOPMENT GROUPS and TASK FORCES

B. Special Committees

1.13 Tellers Committee

The Tellers Committee shall consist of a chairperson recommended by the President-Elect and confirmed by the Executive Board. The chairperson, subject to the Executive Board's review, shall appoint ~~three~~ other committee members as necessary. All appointments shall be for 1-year terms. The Tellers Committee shall:

1.13.1 Oversee ~~Count~~ and certify the results of each election and other membership votes.

Rational: To amend the Bylaws to allow for electronic voting.

Vickie Lewandowski Elected IAFP Secretary

The International Association for Food Protection welcomes Ms. Vickie Lewandowski to the Executive Board as Secretary. Ms. Lewandowski will take office at the conclusion of the Awards Banquet at IAFP 2006, the Association's 93rd Annual Meeting in Calgary, Alberta, Canada. By accepting this position, she made a five-year commitment to the Association and will begin her term as President in 2009.

Ms. Vickie Lewandowski is an Associate Principal Microbiologist for Kraft Foods, Inc. where she is responsible for providing microbiological and food safety expertise to the global cream cheese, cultured dairy products, and specialty cheese businesses. Her responsibilities fall into the areas of HACCP development and support, microbial challenge studies, product development support (growth and productivity initiatives), processing plant support (troubleshooting, product startups), and training.

Ms. Lewandowski has over 19 years of industry experience in microbiology and food safety. Beginning her career as a quality control technologist at Kemps/Marigold Foods, she experienced the challenges that occur daily at a manufacturing facility. She then advanced to a technologist position at Pillsbury, where she became acutely aware of the critical role of microbiology and food safety in product development while working with R&D associates on prepared dough products and frozen meals (pizza). Ms. Lewandowski then joined the staff at r-Tech (Land O' Lakes) where she developed expertise on test methodologies and development of challenge study/method validation protocols.

Upon completion of her Masters Degree, Ms. Lewandowski accepted a food microbiologist position at Cargill. There she provided microbiological and food safety expertise to a wide variety of global food businesses including meat, eggs, poultry, juice concentrate, corn milling, wheat milling, chocolate processing, soy processing, etc. In addition to working with product developers at Cargill, Ms. Lewandowski also provided support to the processing plants through applied research and troubleshooting.

Ms. Lewandowski is a recognized expert in molecular subtyping methodology (PFGE), pathogen and spoilage organism test methodologies, challenge study development, and HACCP. The opportunity to work with several large, diverse companies has allowed Ms. Lewandowski to engage in an array of industry experiences, to gain knowledge of a vast number of food products and processes and ultimately, to be an integral part of providing safe food to millions worldwide.

Since joining IAFP in 1995, Ms. Lewandowski has been a very active member. She served on the Local Arrangements Committee for the 2000 IAFP Annual Meeting in Minneapolis. She has organized and convened several well-received symposia and has been a presenter for symposia and technical sessions. Ms. Lewandowski is currently a member of the Program Committee (since 2002) and is serving as Chairperson of this committee for 2006. She is currently the Vice Chairperson of the Dairy Quality and Safety Professional Development Group. Ms. Lewandowski has been a judge for the Developing Scientist Competition for 2004 and 2005 and was Chairperson of that committee for 2005.

Other professional affiliations for Ms. Lewandowski include membership in the Institute of Food Technologists and the American Society for Microbiology. She is also an active member of the Associated Illinois Milk, Food and Environmental Sanitarians, an Affiliate of IAFP.

Ms. Lewandowski earned her Bachelor of Science Degree in Food Science from the University of Minnesota. While pursuing her career, she continued her education and was awarded her Masters Degree in Food Microbiology in 1997.

AFFILIATE OFFICERS

ALABAMA ASSOCIATION FOR FOOD PROTECTION

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Pres. Elect, Brian Bower ..... Headland
Vice Pres., Patricia Lindsey ..... Cullman
Past Pres., Jon Searles ..... Sylacauga
Sec'y. Treas., Karen Crawford ..... Tuscaloosa
Delegate, Tom McCaskey ..... Auburn

Mail all correspondence to:
G. M. Gallaspy
P.O. Box 303017, Suite 1250
Montgomery, AL 36130-3017
334.206.5375
E-mail: ggallaspy@adph.state.al.us

ALBERTA ASSOCIATION FOR FOOD PROTECTION

Pres., Kevin Webster ..... Edmonton
Past Pres., Gary Gensler ..... Edmonton
Sec'y., Barb Tomik ..... Edmonton
Treas., Susan Gibson ..... Edmonton
Delegate, Lynn M. McMullen ..... Edmonton

Mail all correspondence to:
Lynn M. McMullen
University of Alberta
Dept. of Ag., Food and Nutritional Science
4-10 Ag. For. Center
Edmonton, Alberta T6G 2P5 Canada
780.492.6015
E-mail: lynn.mcmullen@ualberta.ca

ARIZONA ENVIRONMENTAL HEALTH ASSOCIATION

Pres., Chris Reimus ..... Phoenix
Pres. Elect, Mohammed Heydari ..... Phoenix
Past Pres., Aimee Upton ..... Phoenix
Sec'y., Susie Sid ..... Phoenix
Treas., Veronica Oros ..... Tempe
Delegate, Mohammed Heydari ..... Phoenix

Mail all correspondence to:
Chris Reimus
Maricopa County Environmental Health Division
1001 N. Central Ave., Suite 300
Phoenix, AZ 85004
480.820.7655 ext. 202
E-mail: creimus@mail.maricopa.gov

BRAZIL ASSOCIATION FOR FOOD PROTECTION

Pres., Maria Teresa Destro ..... São Pãulo
Vice Pres., Ivone Delazari ..... São Pãulo
Past Pres., Mariza Landgraf ..... São Pãulo
Sec'y., Ellen Lopes ..... São Pãulo
Treas., Bernadette D.G.M. Franco ..... São Pãulo
Delegate, Maria Teresa Destro ..... São Pãulo

Mail all correspondence to:
Maria Teresa Destro
Univ. São Pãulo
Av Prof. Lineu Prestes 580 B114
São Pãulo, SP 05.508-900 Brazil
55.113.091.2199
E-mail: mtdestro@usp.br

BRITISH COLUMBIA FOOD PROTECTION ASSOCIATION

Pres., Terry Peters ..... Richmond
Vice Pres., Annette Moore ..... Abbotsford
Sec'y., Ernst Schoeller ..... West Vancouver
Treas., Lorraine McIntyre ..... Vancouver
Delegate, Lorraine McIntyre ..... Vancouver

Mail all correspondence to:
Terry Peters
5500 Woodpecker Dr.
Richmond, British Columbia V7E 5A8 Canada
604.666.1080
E-mail: terry_peters@telus.net

CALIFORNIA ASSOCIATION OF DAIRY AND MILK SANITARIANS

Pres., Michelle Clark ..... Hayward
1st Vice Pres., Ross Henderson-McBean ..... Sacramento
2nd Vice Pres., Sarah Goreham-Houston ..... Fairfield
1st Past Pres., Frances Valles ..... Ontario
2nd Past Pres., Dawn Stead ..... Woodland Hills
Exec. Sec'y./Treas., John Bruhn ..... Davis
Delegate, John Bruhn ..... Davis

Mail all correspondence to:
John C. Bruhn
101B Cruess Hall
Dairy Research and Information Center
University of California-Davis
Food Science and Technology
Davis, CA 95616-8598
530.752.2192
E-mail: jcbruhn@ucdavis.edu

CAPITAL AREA FOOD PROTECTION ASSOCIATION

Pres., Randy Huffman ..... Arlington, VA
Vice Pres., LeeAnne Jackson ..... College Park, MD
Past Pres., Jianghong Meng ..... College Park, MD
Sec'y., Kalmia Kniel ..... Newark, DE
Treas., Alan Parker ..... Annapolis, MD
Delegate, Carl Custer ..... Washington, D.C.

Mail all correspondence to:
Kalmia E. Kniel
University of Delaware
Dept. of Animal & Food Sciences
044 Townsend Hall, 531 S. College Ave.
Newark, DE 19716-2150
302.831.6513
E-mail: kniel@udel.edu

CAROLINAS ASSOCIATION FOR FOOD PROTECTION

Pres., Paul Dawson ..... Clemson, SC
Vice Pres., Melissa Renfrow ..... Hope Mills, NC
Past Pres., James Ball ..... Salisbury, NC
Sec'y., Xiuping Jiang ..... Clemson, SC
Treas., Steve Tracey ..... Salisbury, NC
Delegate, Paul Dawson ..... Clemson, SC

Mail all correspondence to:
Paul Dawson
Clemson University
Food Science Dept.
224 Poole Ag. Center, P.O. Box 340371
Clemson, SC 29634-0371
864.656.3397
E-mail: pdawson@clemson.edu

CONNECTICUT ASSOCIATION FOR FOOD PROTECTION

Pres., David Pantalone ..... Ansonia
Vice Pres./Treas., Kevin Gallagher ..... Milford
Vice Pres./Asst. Treas., Karen Rotella ..... Middlebury
Sec'y., Bob Brown ..... East Bridgewater
Delegate, Frank Greene ..... Hartford

Mail all correspondence to:
Frank Greene
CT Dept. of Consumer Protection
Div. of Food and Standards
165 Capitol Ave., Room 165
Hartford, CT 06106
860.713.6160
E-mail: frank.greene@po.state.ct.us

FLORIDA ASSOCIATION FOR FOOD PROTECTION

Pres., Rick Barney ..... Tampa
Vice Pres., Natalie Dyenson ..... St. Cloud
Past Pres., Marjorie Jones ..... Palm City
Sec'y., Joe Watson ..... Oviedo
Treas., Kristin Boncaro ..... Deltona
Delegate, Peter Hibbard ..... Oviedo

Mail all correspondence to:
Rick A. Barney
Sweetbay Supermarket
3801 Sugar Palm Dr.
Tampa, FL 33619
813.620.1139 ext. 332
rabarney@kashnkarry.com

GEORGIA ASSOCIATION FOR FOOD PROTECTION

Pres., Oscar Garrison ..... Atlanta
Pres. Elect, Harold King ..... Atlanta
Vice Pres., Tonya Gray ..... Newnan
Past Pres., Louis Hughes ..... Brunswick
Sec'y., Pamela Metheny ..... Atlanta
Treas., Jim Camp ..... Newnan
Delegate, David Fry ..... Lawrenceville

Mail all correspondence to:
Oscar Garrison
GA Dept. of Agriculture
Consumer Protection Division
Capitol Square, Room 306
Atlanta, GA 30334
404.656.3627
E-mail: ogarris@agr.state.ga.us

IDAHO ENVIRONMENTAL HEALTH ASSOCIATION

Pres., Paul E. Guenther ..... Lewiston
Pres. Elect, Dale King ..... Orofino
Past Pres., Barry Burnell ..... Boise
Sec'y./Treas., Steve Pew ..... Pocatello
Delegate, Paul E. Guenther ..... Lewiston

Mail all correspondence to:
Paul E. Guenther
No. Central District Health Dept.
215 Tenth St.
Lewiston, ID 83501
208.799.3100
pguenthe@phd2.state.id.us

ASSOCIATED ILLINOIS MILK, FOOD AND ENVIRONMENTAL SANITARIANS

Pres., Jayne Nosari ..... Springfield
Pres. Elect, John Ellingson ..... Rockford
1st Vice Pres., Rebecca Thomas ..... Manlius
2nd Vice Pres., Kris Zetterlund ..... Cary
Past Pres., Pat Callahan ..... Springfield
Sec'y., Steve DiVincenzo ..... Springfield
Treas., Dennis Gaalswyk ..... Naperville
Delegate, Jayne Nosari ..... Carlinville

Mail all correspondence to:
Steve DiVincenzo
Illinois Dept. of Public Health
525 W. Jefferson St.
Springfield, IL 62761
217.785.2439
sdivince@idph.state.il.us

INDIANA ENVIRONMENTAL HEALTH ASSOCIATION, INC.

Pres., Richard Wise ..... Indianapolis
Pres. Elect, Chris Menze ..... Franklin
Vice Pres., Pat Minnick ..... Lebanon
Past Pres., Scott Gilliam ..... Indianapolis
Treas., Mary Stiker ..... Indianapolis
Sec'y., Margaret Voyles ..... Indianapolis
Delegate, Helene Uhlman ..... Hammond

Mail all correspondence to:
Helene Uhlman
Hammond Health Dept.
649 Conkey St., East
Hammond, IN 46324-1101
219.853.6358

IOWA ASSOCIATION FOR FOOD PROTECTION

Pres., Leo Timms ..... Ames
1st Vice Pres., Lisa Pool ..... New Hampton
2nd Vice Pres., Charlie Uhlenhopp ..... Arlington
Past Pres., Bill Nietert ..... Anamosa
Sec'y., Phyllis Borer ..... Sibley
Treas., Jim Mills ..... Sibley
Delegate, Leo Timms ..... Ames

Mail all correspondence to:
Phyllis Borer
AMPI
1020 - 4th Ave., P.O. Box 36
Sibley, IA 51249
712.754.2511 ext. 33
E-mail: borerp@ampi.com

KANSAS ENVIRONMENTAL HEALTH ASSOCIATION

Pres., Tom Morey ..... Topeka
2nd Vice Pres., Bronson Farmer ..... Salina
Past Pres., Karen Purvis ..... Hays
Sec'y., Marlene Stamm ..... Junction City
Treas., Greg Willis ..... Hoisington
Delegate, Michael Kopf ..... Salina

Mail all correspondence to:
Cynthia Kastens
Sedgwick County Code Enforcement
1144 S. Seneca
Wichita, KS 67213-4443
316.383.7951
E-mail: ckastens@sedgwick.gov

KENTUCKY ASSOCIATION OF MILK, FOOD AND ENVIRONMENTAL SANITARIANS

Pres., Tony White ..... Harrodsburg
Pres. Elect, Matthew Rhodes ..... Louisville
Vice Pres., Vonia Grabeel ..... Lexington
Past Pres., Laura Strevels ..... Edgewood
Sec'y., Branda Haydon ..... Waddy
Treas., Mark Reed ..... Frankfort
Delegate, Matthew Rhodes ..... Louisville

Mail all correspondence to:
Matt Rhodes
Jefferson Co. Health Dept.
400 E. Gray St
Louisville, KY 40202
502.574.6633
E-mail: matt.rhodes@loukymetro.org

KOREA ASSOCIATION OF MILK, FOOD AND ENVIRONMENTAL SPECIALISTS

Pres., Deog-Hwan Oh ..... Kangwon
Vice Pres., Dong-Kwan Jeong ..... Pusan
Past Pres., Duck-Hwa Chung ..... Kyungnam
Sec'y., Sang-Do Ha ..... Gyunggi
Delegate, Sang-Do Ha ..... Gyunggi

Mail all correspondence to:
Sang-Do Ha
Chung-Ang University
Dept. of Food Science and Technology
72-1 Naeri, Daeduk-myun
Ansug, Gyunggi 456-756
South Korea
33.250.6457
E-mail: sangdoha@post.cau.ac.kr

METROPOLITAN ASSOCIATION FOR FOOD PROTECTION

Pres., Howard Rabinovitch ..... North Wales, PA
1st Vice Pres., Gary Moore ..... West Caldwell, NJ
2nd Vice Pres., Alan Talarsky ..... Trenton, NJ
Sec'y./Treas., Carol Schwar ..... Washington, NJ
Delegate, Fred Weber ..... Hamilton, NJ

Mail all correspondence to:
Carol Schwar
Warren County Health Dept.
319 W. Washington Ave.
Washington, NJ 07882
908.689.6693
E-mail: cschwar@entermail.net

MEXICO ASSOCIATION FOR FOOD PROTECTION

Pres., Fausto Tejeda-Trujillo ..... Puebla
Vice Pres., Nanci E. Martinez-Gonzalez ..... Guadalajara
Past Pres., Lydia Mota De La Garza ..... Mexico City
Sec'y., M. Refugio Torres-Vitela ..... Guadalajara
Treas., Norma Heredia ..... Monterrey
Delegate, Montserrat Hernandez-Itturriaga ..... Queretaro

Mail all correspondence to:
Alejandro Castillo
Texas A&M University
2471 TAMU
Kleberg Center, Room 314A
College Station, TX 77843-2471
979.845.3565
E-mail: a-castillo@tamu.edu

MICHIGAN ENVIRONMENTAL HEALTH ASSOCIATION

Pres., Brian Cecil ..... Grass Lake
Pres. Elect., Alan Hauck ..... Ann Arbor
Past Pres., John Gohlke ..... Lansing
Treas., Becky Ouellette ..... Lansing
Sec'y., Kristen Schweighoefer ..... Ann Arbor
Delegate, Brian Cecil ..... Grass Lake

Mail all correspondence to:
Krisen Schweighoefer
Washtenaw Co. Planning & Environment
705 N. Zeeb Road, P.O. Box 8645
Ann Arbor, MI 48107
734.222.3968
E-mail: schweigk@ewashtenaw.org

MISSISSIPPI ENVIRONMENTAL HEALTH ASSOCIATION

Pres., Tim Butts ..... Louisville
Past Pres., Anne Hogue ..... Canton
Sec'y./Treas., Elizabeth Lane ..... Brandon
Delegate, Tim Butts ..... Louisville

Mail all correspondence to:
Anne Hogue
Mississippi State Dept. of Health
317 N. Union
Canton, MS 39046
601.750.9916
E-mail: annehogue@msdh.state.ms.us

MISSOURI MILK, FOOD AND ENVIRONMENTAL HEALTH ASSOCIATION

Pres., Andrew Hoffman ..... Warrenton
Pres. Elect, Steve Raithel ..... Jefferson City
Vice Pres., Steve Crawford ..... Arnold
Past Pres., Marsha Perkins ..... Columbia
Sec'y., Cathy Sullivan ..... Marshall
Treas., Gala Jaramillo ..... Jefferson City
Delegate, Cathy Sullivan ..... Marshall

Mail all correspondence to:
Andrew Hoffman
Warren Co. Health Dept.
105 S. Market St.
Warrenton, MO 63383
636.456.7169
E-mail: ahoffman@co.warren.mo.us

NEBRASKA ASSOCIATION OF MILK AND FOOD SANITARIANS

Pres., Harshavardhan Thippareddi ..... Lincoln
Vice Pres., Tom Tieso ..... Lincoln
Past Pres., Gary Hosek ..... Lincoln
Treas., Jill Schallehn ..... Omaha
Delegate, Harshavardhan Thippareddi ..... Lincoln

Mail all correspondence to:
Tom Tieso
Nebraska Dept. of Agriculture
3703 S. 14th
Lincoln, NE 68502
402.471.2176
E-mail: tomlt@agr.state.ne.us

NEW YORK STATE ASSOCIATION FOR FOOD PROTECTION

Pres., Carl LaFrate ..... Baldwinsville
Pres. Elect, Kevin Immerman ..... Marcellus
Past Pres., Robert Karches ..... Orchard Park
Council Chairman, John Grom ..... Liverpool
Sec'y., Janene Lucia ..... Ithaca
Delegate, Steve Murphy ..... Ithaca

Mail all correspondence to:
Janene Lucia
NYS Assn. for Food Protection
172 Stocking Hall
Ithaca, NY 14853
607.255.2892
E-mail: jgg3@cornell.edu

NEW ZEALAND ASSOCIATION FOR FOOD PROTECTION

Pres., Roger Cook ..... Wellington
Sec'y., Rosemary Whyte ..... Christchurch
Delegate, Roger Cook ..... Wellington

Mail all correspondence to:
Roger Cook
New Zealand Food Authority
PO Box 2835, North Tower, 68 Jervois Quay
Wellington, New Zealand
64.4.463.2523
E-mail: roger.cook@nzfsa.govt.nz

NORTH DAKOTA ENVIRONMENTAL HEALTH ASSOCIATION

Pres., Terry Ludlum ..... Fargo
1st Vice Pres., Grant Larson ..... Fargo
2nd Vice Pres., Allen McKay ..... Devils Lake
Past Pres., Dick Bechtel ..... Mandan
Sec'y., Debra Larson ..... Bismarck
Treas., Lisa Well ..... Bismarck
Delegate, Terry Ludlum ..... Fargo

Mail all correspondence to:
Debra Larson
ND Dept. of Health
Div. of Food and Lodging
600 E. Blvd. Ave., Dept. 301
Bismarck, ND 58505
701.328.1291
E-mail: djlarson@state.nd.us

OHIO ASSOCIATION OF FOOD AND ENVIRONMENTAL SANITARIANS

Pres., Dan McElroy ..... Cincinnati
1st Vice Pres., Gloria Swick-Brown ..... Columbus
2nd Vice Pres., Barry Pokorny ..... Fairfield
Past Pres., Virginia Meacham ..... Cincinnati
Sec'y./Treas., Donald Barrett ..... Columbus
Delegate, Gloria Swick-Brown ..... Columbus

Mail all correspondence to:
Gloria Swick-Brown
246 N. High St., P.O. Box 118
Columbus, OH 43216
614.466.7760
E-mail: gswick@odh.ohio.gov

ONTARIO FOOD PROTECTION ASSOCIATION

Pres., Kathy Wilson ..... Mississauga
Vice Pres., Diana Bennett ..... Burlington
Past Pres., Malcolm McDonald ..... Cobourg
Sec'y./Treas., Paul Baxter ..... Kitchener
Delegate, Kathy Wilson ..... Mississauga

Mail all correspondence to:
Gail C. Seed
White-Rose Farms, Inc.
R.R. 3
Brighton, Ontario N0J 1B0 Canada
519.463.5674
E-mail: seed@golden.net

PENNSYLVANIA ASSOCIATION OF MILK, FOOD AND ENVIRONMENTAL SANITARIANS

Pres., Jonathan Plummer ..... Hatfield
Pres. Elect, Keith Hay ..... Fairhope
Vice Pres., Ronald Davis ..... Dallas
Past Pres., Samuel Maclay ..... Mechanicsburg
Sec'y., Eugene Frey ..... Lancaster
Treas., Connie Oshop ..... New Galilee
Delegate, Eugene Frey ..... Lancaster

Mail all correspondence to:
Eugene Frey
Land O'Lakes, Inc.
307 Pin Oak Place
Lancaster, PA 17602-3469
717.397.0719
E-mail: erfrey@landolakes.com

PORTUGAL ASSOCIATION FOR FOOD PROTECTION

Pres., Laurentina M.R. Pedroso ..... Monte De Caparica
Delegate, Laurentina M.R. Pedroso ..... Monte De Caparica

Mail all correspondence to:
Laurentina M.R. Pedroso
Egas Moniz, CRL
Campus Universitario
Quinta Da Granja
Monte De Caparica, Caparica 2829-511 Portugal
35.1.917.61.2729
E-mail: lpedroso@netcabo.pt

QUEBEC FOOD PROTECTION ASSOCIATION

Pres., Gisele LaPointe ..... Quebec
Pres. Elect, Julie Jean ..... Quebec
Vice Pres., Ismail Fliss ..... Quebec
Sec'y., Louise Blanchet ..... Sainte-Foy
Delegate, Julie Jean ..... Quebec

Mail all correspondence to:
Gisese LaPointe
Universite Laval
Dept. of Food Science and Nutrition
Quebec QC G1K 7P4 Canada
418.656.2131 ext. 5984
E-mail: gisele.lapointe@fsaa.ulaval.ca

SOUTH DAKOTA ENVIRONMENTAL HEALTH ASSOCIATION

Pres., John Weaver ..... Aberdeen
Pres. Elect, Roger Puthoff ..... Huron
Past Pres., Mark Schuttloffel ..... Sioux Falls
Sec'y. Treas., Mike Fillaus ..... Pierre
Delegate, Darwin Kurtenbach ..... Pierre

Mail all correspondence to:
John Weaver
21 – 13th Ave. NW
Aberdeen, SD 57401
Phone: 605.226.7451
E-mail: john.weaver@mail.ihs.gov

SOUTHERN CALIFORNIA ASSOCIATION FOR FOOD PROTECTION

Pres., Marty Gushwa ..... Moorpark
Pres. Elect., Dawn Stead ..... Woodland Hills
Vice Pres., Rebecca Bedner ..... Vernon
Sec'y., Matt McGillicuddy ..... Saugus
Treas., Margaret Burton ..... San Diego
Delegate, Steve Nason ..... Camarillo

Mail all correspondence to:
Margaret Burton
Jack in the Box
9330 Balboa Ave.
San Diego, CA 92123
858.571.2441
E-mail: margaret.burton@jackinthebox.com

TENNESSEE ASSOCIATION OF MILK, WATER AND FOOD PROTECTION

Pres., Robert Owen ..... Murfreesboro
Pres. Elect., Jim Howie ..... Waxhaw
Sec'y./Treas., F. Ann Draughon ..... Knoxville
Delegate, F. Ann Draughon ..... Knoxville

Mail all correspondence to:
F. Ann Draughon
University of Tennessee
Food Safety & Processing Center
2605 River Road
Knoxville, TN 37996
865.974.8400
E-mail: draughon@utk.edu

TEXAS ASSOCIATION FOR FOOD PROTECTION

Pres., Thomas Supak ..... Brenham
Past Pres., Gregory G. Crishi ..... Dallas
Sec'y. Treas., Ron Richter ..... College Station
Delegate, Fred Reimers ..... San Antonio

Mail all correspondence to:
Tom Supak
Blue Bell Creameries, Inc.
P.O. Box 1807
Brenham, TX 77833
979.836.7977
E-mail: tommy.supak@bluebell.com

UNITED KINGDOM ASSOCIATION FOR FOOD PROTECTION

Pres., Gordon Hayburn ..... Cardiff, Wales, UK
Pres. Elect., Chris Griffith ..... Cardiff, Wales, UK
Vice Pres., Louise Fielding ..... Cardiff, Wales, UK
Sec'y., Derrick Blunden ..... Driffield, E. Yorkshire, UK
Treas., Ginny Moore ..... Cardiff, Wales, UK
Delegate, David Lloyd ..... Cardiff, Wales, UK

Mail all correspondence to:
Gordon Hayburn
Univ. of Wales Institute, Cardiff
School of Applied Sciences
Colchester Ave.
Cardiff, Wales CF23 9XR
United Kingdom
44.0.292041.6456
E-mail: ghayburn@uwic.ac.uk

UPPER MIDWEST DAIRY INDUSTRY ASSOCIATION

Pres., Bruce Steege ..... Zumbrota
Vice Pres., Dan Erickson ..... North St. Paul
Sec'y./Treas., Paul Nierman ..... Mounds View
Delegate, Dan Erickson ..... North St. Paul

Mail all correspondence to:
Paul Nierman
DQCI Services
5205 Quincy St.
Mounds View, MN 55112-1400
763.785.0484
E-mail: paul@dqci.com

WASHINGTON ASSOCIATION FOR FOOD PROTECTION

Pres., George Berkompas ..... Ferndale
Pres. Elect, Marty Brown ..... Bothell
Past Pres., Nancy Byers ..... Olympia
Sec'y. Treas., Stephanie Olmsted ..... Kent
Delegate, Stephanie Olmsted ..... Kent

Mail all correspondence to:
Stephanie Olmsted
Safeway Inc.
32727 193rd Ave. SE
Kent, WA 98042
425.455.8953
stephanie.olmsted@safeway.com

WISCONSIN ASSOCIATION FOR FOOD PROTECTION

Pres., Marianne Smukowski ..... Madison
Pres. Elect, Matt Mathison ..... Madison
1st Vice Pres., Tom Leitzke ..... Madison
2nd Vice Pres., Cindy Dohm ..... Madison
Past Pres., Howard Mack ..... Barabro
Sec'y., Randy Daggs ..... Sun Prairie
Treas., Neil Vassau ..... Verona
Delegate, Randy Daggs ..... Sun Prairie

Mail all correspondence to:
Randy Daggs
6699 Prairie View Dr.
Sun Prairie, WI 53590-9430
608.837.2087
E-mail: rdaggs@juno.com

WYOMING ENVIRONMENTAL HEALTH ASSOCIATION

Pres., Sherry Maston ..... Wheatland
Pres. Elect, Doug Evans ..... Gillette
Past Pres., Roy Kroeger ..... Cheyenne
Sec'y., Ellen Southwell ..... Cheyenne
Treas., Bryan Grapes ..... Torrington
Delegate, Sherry Maston ..... Wheatland

Mail all correspondence to:
Ellen Southwell
Laurie Co. Health Dept.
100 Central Ave., Room 266
Cheyenne, WY 82007
307.633.4090
E-mail: esouthwell@laramiecounty.com

NEW MEMBERS

AUSTRALIA

Donglai Zhang
University of Tasmania
Hobart, Tasmania

CANADA

Johanna L. Leggate
Carleton University
Ottawa, Ontario

Kirsten A. Mattison
Health Canada
Ottawa, Ontario

Sandra M. Moorhead
University of Guelph
Guelph, Ontario

Marin Pavlic
University of Guelph
Guelph, Ontario

Nizar W. Ramji
NR Consultants
Vancouver, British Columbia

GERMANY

Guenter Klein
Tieraerztliche Hochschule Hannover
Hannover

MEXICO

Bertha A. Hernandez-Rodriguez
Universidad Autonoma Chapingo
Texcoco, Edo de Mexico

SOUTH KOREA

Jun-Young Cha
Daegu Haany University
Dae-Gu

Jung Em Joh
Seoul

THAILAND

Kanyarat Chooprang
King Mongkut's Institute
of Technology Ladkrabang
Bangkok

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King Mongkut's Institute
of Technology Ladkrabang
Bangkok

Pussadee Tangwatcharin
Prince of Songkla University
Hat Yai, Songkhla

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Manning Beef LLC
Pico Rivera

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Food Safety and HACCP Compliance
Woodland Hills

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Wawa Inc.
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Bill Green
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Teri S. Troxel
Masterfoods USA
Waco

VIRGINIA

Michael V. Campbell
Henrico Health Dept.
Richmond

NEW GOLD SUSTAINING MEMBER

Bruce J. Bradley
Microbial-Vac Systems, Inc.
Jerome, ID

NEW SUSTAINING MEMBER

Jeffrey M. Farber
Health Canada
Ottawa, Ontario, Canada

UPDATES

Sargento Foods Inc. Has Announced the Hiring of Michael G. Vaszily as Senior Brand Manager

Michael G. Vaszily has been hired as senior brand manager of its Consumer Products Division, with responsibility for refrigerated snacks and shredded cheese.

Mr. Vaszily grew up in Racine, WI and earned his MBA from Marquette University in 2000.

Before joining the Sargento family in December, Mr. Vaszily was the global products innovation manager for Spectrum Brands, where he helped reshape the Remington Shaving and Grooming product line. He also was a brand manager for Heinz Ketchup at Heinz, and for Ziploc at S.C. Johnson.

Denise Mullinax Joins California Dairy Research Foundation as Assistant Director

The California Dairy Research Foundation (CDRF) recently announced the appointment of Denise Mullinax as assistant director of the California Dairy Quality Assurance Program (CDQAP). Ms. Mullinax comes to the CDRF from Hilmar Cheese Co. where she worked on environmental issues, biosecurity, milk quality, and risk management.

Ms. Mullinax received her bachelor's degree in animal science and master's of agriculture management from the University of California-Davis. She spent two years as a UC cooperative extension advisor before joining Hilmar Cheese Co. in 1998 as producer education coordinator. Her most recent position at Hilmar was dairy environmental and quality coordinator.

Food Institute Elects New Trustees from Processing and Retailing Sectors

At the most recent meeting of the Food Institute's board of trustees, Peter R. Lavoy, president and chief operating officer of Foodtown, Inc., Avenel, NJ, and Dean E. Erstad, senior vice president sales, Seneca Foods Corporation, Janesville, WI, were unanimously elected to the Board of the Elmwood Park, NJ–Trade Association.

Mr. Lavoy has had an extensive career in the grocery industry. A graduate of the University of Miami in Florida, with a B.S. in marketing, he joined Foodtown in 1997 and was appointed president and chief operating officer in January of 1999. Prior to joining Foodtown, he was with Grand Union for 16 years, holding various positions in operations, procurement and merchandising throughout the US, and A&P for 14 years, as corporate vice president of merchandising and procurement.

Dean Erstad has been with the Seneca Foods Corporation since 1995 and presently is responsible for brand, private label, foodservice, frozen, and international business segments. Previously, he held the position of vice president of Private Label Retail where he integrated two major acquisitions into the Private Label segment. From 1992 to 1995, Mr. Erstad was an account executive for Owatonna Canning Company.

The remainder of the board consists of chairman Michael J. Slattery, president and CEO of Slattery Marketing Corp., vice chairman Joseph W. Crocker, Crocker & Associates, and treasurer Donna George, vice president, Heritage Brands LLC.

Our other trustees include: Mark Allen, president International Foodservice Distributors Association; Bill Bishop, president and CEO Willard Bishop Consulting; Richard Frank, Esq., Olsson, Frank and Weeda, P.C.; Nancy Glick, executive vice president, Ruder Finn, Inc.; John Lord, professor of food marketing, Saint Joseph's University; Michael Sansolo, senior vice president, Food Marketing Institute; John Woodhouse, retired chairman/CEO, Sysco Corporation, and Brian Todd, president of the Food Institute.

Prime Energy Appoints New Director of Operations

Prime Energy has announced the appointment of James Blohm to the position of director of operations. Mr. Blohm will be located at the company's headquarters in LaPorte, TX.

As director of operations, Mr. Blohm will be responsible for managing and leading Prime Energy's business development, marketing, and fleet groups. Prior to joining Prime Energy, he served as vice president of sales operations at National Oilwell Vacro in Houston, TX.

Mr. Blohm received an MBA from Rice University and a bachelor's degree in operations management from the University of Houston.

International Association for Food Protection® NEWS

Silliker Acquires Atlangene Applications, Leading Genetic Testing Laboratory in Europe

Silliker Group Corp. announced the acquisition of the Clabo Group, a network of food testing and consulting laboratories in France.

Widely recognized for its preeminence in semi-automated microbiology technology, the Clabo Group is comprised of 12 companies, including Atlangene Applications, one of the leading genetic testing laboratories in Europe.

Founded in 1996, Atlangene is ISO 17025 accredited and provides expert analysis to pharmaceutical, food, and food processing companies throughout Europe from its state-of-the-art laboratory located near Nantes.

"With the addition of Atlangene to our existing GMO laboratory in Cergy, France, we have significantly augmented our ability to provide companies both here and abroad with outstanding genetic testing services," said Dr. Jodene Jurgens, director of the Silliker GMO Testing Center in Cedar Rapids, IA.

Silliker GMO testing facilities specialize in real-time PCR testing, a fast and reliable method that is used to verify the absence of or levels of GMOs in products. Through SillikereSTAR.com, an online data management system, customers are provided with real-time access to their GMO testing results.

"We're looking forward to working with Atlangene's outstanding professionals to advance the science of genetic detection and enhance company programs that are designed to help companies meet increasingly stringent international regulations for GMOs," Dr. Jurgens said.

Model Food Emergency Response Plan: Cooperative Effort Results in Model Template

The Food and Drug Administration (FDA) in cooperation with the National Association of State Departments of Agriculture (NASDA), USDA's Food Safety and Inspection Service (FSIS), and the Department of Homeland Security (DHS) has announced the availability of a model Food Emergency Response Plan Template. The goal of the response plan is to enhance the protection of the nation's agricultural industry and food security through prevention, detection, response, and recovery.

The template provides states with a guide to develop either a stand-alone emergency response plan for responding to a food-related emergency or an addendum to an existing all-hazard state emergency response plan. Useful planning tools include documents previously developed in cooperation with the DHS — national planning scenarios, target capabilities, and uniform task lists.

"FDA remains vigilant in its mission to protect our country's food supply and continues to maintain collaborative partnerships with our federal and state partners by planning for, monitoring and reacting to any potential threats," said Dr. Robert E. Brackett, director of FDA's Center for Food Safety and Applied Nutrition. "By collaborating more closely with our partners involved in food safety and security, we will better leverage all of the available resources to be better prepared for any food emergency incident."

Because a food emergency could occur at any point from farm to fork, including pre-harvest production, processing, and distribution, states can use the template to develop useful plans to manage a food emergency. In addition, states can establish a uniform structure and content that will result in response plans that are similar in structure, scope, and response operations among all states.

A food-related emergency involves the unintentional or deliberate contamination, threatened or actual, of food that impacts or may impact human health. A food emergency response plan does not apply to food incidents routinely handled by local or state health departments.

Consumption of Risky Foods Declines

Americans are eating safer. The number of people who reported eating one or more foods associated with an increased risk of foodborne disease declined by a third from 1998 to 2002, according to survey results released at the International Conference on Emerging Infectious Diseases.

"Overall we are seeing a decline in risky food consumption and that may be attributable to published media reports of foodborne outbreaks and outreach efforts by the public health community," says Erica Weis of the California Department of Health Services, the lead author on the study.

Weis and her colleagues compared data from two Foodborne Diseases Active Surveillance Network (FoodNet) telephone surveys conducted in 1998 and 2002, in which subjects were asked about

foods they had consumed in the previous week. Specifically they looked at whether the subject had consumed one of 7 "risky foods" known to be associated with an increased risk of foodborne illness:

- pink hamburgers
- pink ground beef
- raw fresh fish
- raw oysters
- raw/unpasteurized milk
- runny eggs
- alfalfa sprouts

In 1998, 31% of those surveyed said that they had consumed one or more risky foods in the previous week. By 2002, that number had dropped to 21%. The most commonly reported risky food item consumed was runny eggs.

Men ages 18–64 were more likely to report consuming risky foods than women of the same age group (38% vs. 30%) and Asians/Pacific Islanders were more likely to consume risky foods than whites (32% vs. 21%). The safest eaters were African Americans, only 15% of whom reported consuming one or more risky foods in the 2002 survey.

Among subjects under the age of 18, those who were immunocompromised were much more likely to consume risky foods compared to healthy subjects (21% vs. 14%).

"Consumption of risky foods declined significantly in 2002 compared to 1998. However, in the future there needs to be more targeted outreach to those groups that continue to have high levels of risky food consumption," says Weis. The research was conducted by a working group that included investigators from the California Department of Health Services, the Centers for Disease Control and Prevention, the Connecticut Emerging Infections Program, the Georgia Division of Public Health, the Tennessee Department of Health and the Oregon Department of Human Services.

First General Outbreak of Verocytotoxin-producing *Escherichia coli* O157 in Denmark

This report describes the first general outbreak of verocytotoxin-producing *Escherichia coli* (VTEC) in Denmark. Twenty-five patients, 18 children and seven adults, with culture-confirmed VTEC O157:H7 infection and indistinguishable pulsed-field gel electrophoresis DNA profiles, were identified during a six-month period from September 2003 to March 2004. The outbreak strain possessed the virulence genes: *eae*, *vtx*1 and *vtx*2c. All patients but one presented with diarrhea; none developed hemolytic uremic syndrome. The outbreak was restricted to Copenhagen and surrounding areas. A case-control study including 11 cases and 55 matched controls revealed an association between VTEC O157:H7 infection and shopping in a specific supermarket chain in Copenhagen and surrounding area, matched odds ratio (OR): 8.7 (95% confidence interval (CI): 1.1-71). After exclusion of three assumed secondary cases, only consumption of a particular kind of organic milk from a small dairy was associated with disease OR: 8.7 (95% CI 1.6-48). Environmental and microbiological investigations at the suspected dairy did not confirm the presence of the outbreak strain, but the outbreak stopped once the dairy was closed and thoroughly cleaned.

Verocytotoxin-producing *Escherichia coli* is an important cause of gastroenteritis, in particular in industrialized countries. In recent decades, VTEC has caused a number of outbreaks affecting large numbers of people, including outbreaks associated with both pasteurized and unpasteurized milk.

VTEC is mandatorily reportable in Denmark both through laboratory based surveillance and clinical notifications from the treating physician. Based on laboratory reports, the incidence has increased from 1.0 per 100,000 population in 1999 (53 cases), to 3.1 per 100,000 in 2004 (168 cases). This trend is most likely due to an increased number of stool specimens examined for diarrheagenic *E. coli*, including VTEC. General outbreaks of VTEC gastroenteritis have not previously been seen in Denmark; only sporadic cases or small family clusters of infection have been detected.

In late 2003, the Danish VTEC reference laboratory at Statens Serum Institut observed that seven isolates of VTEC O157:H7 had identical patterns as judged by pulsed-field gel electrophoresis. The samples were received over a period of four months. In January and February 2004, seven additional isolates were detected, and we initiated an investigation of this first general outbreak of VTEC infection in Denmark. The objectives of the investigation were to characterize the outbreak and, if possible, determine the vehicle.

Complete document available at http://www.eurosurveillance.org/em/v11n02/1102-221.asp.

FDA Issues Draft Guidance for the Safe Production of Fresh-cut Fruits and Vegetables

To minimize microbial food safety hazards common to the processing of most fresh-cut fruits and vegetables sold to consumers in a ready-to-eat form, The Food and Drug Adminis-

tration (FDA) published a draft guidance document for producers of fresh-cut produce entitled "Guide to Minimize Microbial Food Safety Hazards of Fresh-cut Fruits and Vegetables."

"Fresh cut produce is the fastest growing sector of the fresh produce industry. This document should help to improve safety by providing clearer guidance on how to reduce health hazards that are potentially introduced during the production process," said acting FDA commissioner Dr. Andrew von Eschenbach.

Processing produce into fresh-cut produce increases the risk of bacterial contamination and growth by breaking the natural exterior barrier of the produce by peeling, slicing, coring, trimming, or mashing with or without washing or other treatment before being packaged for consumption. Examples of fresh-cut products are shredded lettuce, sliced tomatoes, salad mixes (raw vegetable salads), peeled baby carrots, broccoli florets, cauliflower florets, cut celery stalks, shredded cabbage, cut melons, sliced pineapple, and sectioned grapefruit.

This draft guidance discusses the production and harvesting of fresh produce and provides recommendations for fresh-cut processing in several areas: (1) personnel health and hygiene, (2) training, (3) building and equipment, (4) sanitation operations, and (5) fresh-cut produce production and processing controls from product specification to packaging, storage and transport. The final chapters provide recommendations on recordkeeping and on recalls and tracebacks. The guide complements FDA's Current Good Manufacturing Practices regulations by providing specific guidance on the processing of fresh-cut produce.

In the draft guidance, FDA recommends that processors encourage the adoption of safe practices by their partners throughout the supply chain, including produce growers, packers, distributors, transporters, importers, exporters, retailers, food service operators, and consumers, to ensure that the processor's efforts will be enhanced. These practices include: establishing a company policy that employees report any active case of illness to supervisors before beginning work and training; training supervisors to recognize typical signs/symptoms of infectious disease; maintain the proper first aid to protect and cover any wound; and not allow an employee to work with any aspect of fresh or fresh-cut produce, processing equipment or tools until the wound has healed and/or the infectious disease has been treated.

The guidance also recommends that fresh-cut processors consider a preventive control program such as the Hazard Analysis Critical Control Points (HACCP) system to build safety into the processing operations for fresh-cut fruits and vegetables. HACCP is a prevention-based food safety system designed to prevent, eliminate, or reduce to acceptable levels the microbial, chemical, and physical hazards associated with food production.

FDA believes awareness of the common risk factors discussed in this guidance and implementation of preventive controls determined by a firm to be appropriate to its individual operations will enhance the safety of fresh-cut fruits and vegetables.

Consumers can reduce their risk of illness from fresh-cut produce by following safe-handling practices such as refrigerating the product after purchase; using only clean hands, utensils or dishes in preparing the product; and discarding the product when the "use-by" date has expired. More information on safe handling practices of produce can be found at http://www.fightbac.org.

Better Training for Safer Food

"Better Training for Safer Food" is a new initiative of the Commission aimed at organizing a Community (EU) training strategy in the areas of food law, feed law, animal health and animal welfare rules, as well as plant health rules.

Article 51 of Regulation (EC) No 882/2004 Regulation (EC) No. 882/2004 on official controls performed to ensure the verification of compliance with feed and food law, animal health and animal welfare rules, provides the legal instrument for this initiative.

Training will be designed for all staff of competent authorities of Member States involved in official controls activities so as to keep them up-to-date with all aspects of Community law in the above specified areas and ensure that controls are carried out in a more uniform, objective and adequate manner in all Member States.

It is also essential that third countries and in particular developing countries are familiar with EU import requirements and, where they exist, with the possibility of EU support. For this purpose, training organized for Member States in the EU will be open to participants from third countries and specific training sessions will also be organized for third country participants on the spot.

The future Community training strategy in the areas of food law, feed law, animal health, animal welfare and plant health, will be explained in a Commission White Paper expected to be published in June 2006. Pending this publication, a series of training programs has been launched for implementation during 2006.

The main objective of the initiative "Better Training for Safer Food" is the organization and development of a Community training strategy with a view to:

- Ensuring and maintaining a high level of consumer protection and of animal health, animal welfare and plant health
- Promoting a harmonized approach to the operation of Community and national control systems
- Creating an equal level playing field for all food businesses
- Enhancing trade of safe food
- Ensuring fair trade with third countries and in particular developing countries

All links available from http://europa.eu.int/comm/food/training/index_en.htm.

Mad Cow Disease on the Wane Worldwide

Cases of Bovine Spongiform Encepalopathy (BSE) or "mad cow disease" worldwide are declining, according to the UN Food and Agriculture Organization (FAO). They have been dropping at the rate of some 50 percent a year over the past three years, the Organization said.

Amid the current international alarm over avian flu, it is good news that the battle against another worrying disease is being won.

In 2005, just 474 animals died of BSE around the world, compared with 878 in 2004 and 1,646 in 2003, and against a peak of several tens of thousands in 1992, according to figures collected by the Paris-based World Animal Health Organization (OIE), with which FAO works closely.

Only five human deaths resulting from variant Creutzfeldt-Jakob Disease (vCJD), believed to be the human form of BSE, were reported worldwide in 2005. All of them were in the United Kingdom – the country most affected by the disease – where nine deaths were registered in 2004 and 18 in 2003.

Andrew Speedy, an FAO animal production expert, commented: "It is quite clear that BSE is declining and that the measures introduced to stop the disease are effective. But further success depends on our continuing to apply those measures worldwide."

FAO insists on the importance of a scientific approach to detect and control the disease, ensuring it is eradicated in affected countries – and kept out of unaffected ones.

FAO, together with Swiss experts, has been running courses for specialists from countries as far afield as Serbia, Egypt, Vietnam, Argentina, Brazil, Chile, Colombia, Mexico, Peru, Uruguay and Paraguay on BSE diagnosis, surveillance and prevention in the animal feed and meat industries.

Also vital, said Speedy, is a tracking system that allows animals to be identified all the way from birth to shopping basket. This has been adopted across Europe but has yet to be implemented partially or fully in a number of other countries.

Rapid *Salmonella* Test May Reduce Meat and Produce Recalls

An innovative test to detect *Salmonella* in ready-to-eat meats has been developed by Agricultural Research Service (ARS) scientists. The preliminary test–still being evaluated by agency researchers–relies on PCR (polymerase chain reaction) technology to detect food-contaminating microbes on a molecular level.

Food technologist Jitu Patel with the ARS Food Technology and Safety Laboratory, and microbiologist Arvind Bhagwat with the ARS Produce Quality and Safety Laboratory, in Beltsville, MD, compared their laboratory-developed "molecular beacon" test with a commercial rapid-detection test currently in use. While both tests can detect *Salmonella* in eight hours, the laboratory test is less expensive than commercial kits.

To evaluate the new test's efficacy, the scientists artificially contaminated various meats (turkey, bologna and ham slices) and produce (mixed salad, sprouts) with *S. enterica* serovar Typhimurium and allowed it to incubate for 20 hours. Both tests were sensitive enough to detect contamination in the meat products at an estimated level of two to four cells per 25 grams. In comparing the tests after a relatively brief incubation period of eight hours, two to four cells of *Salmonella* were detected in the 25-gram samples of meat as well as produce.

The ability of the molecular beacon test to detect very low levels of *Salmonella* contamination in eight hours will aid the food industry in quality assurance, helping prevent recalls of contaminated meats and produce by stopping the products from being introduced in the marketplace. Detection of contaminated foods could be achieved within a work shift—before shipment takes place.

World Health Organization Global Salm-Surv

Safe food is essential in maintaining a healthy and productive lifestyle. Foods can harbor harmful microorganisms

that may cause serious human illnesses. WHO defines foodborne illnesses as "diseases, usually either infectious or toxic in nature, caused by agents that enter the body through the ingestion of food" and estimates that each year two million people die from diarrheal diseases, mostly attributed to contaminated food and drinking water. In developing countries, where diarrheal diseases are particularly prevalent, determining the proportion due to foodborne diseases can be difficult. Clinical laboratory and public health infrastructure to perform such assessments is not present in all nations. A 1997 WHO survey revealed that up to one-third of WHO Member States indicated a lack of basic infrastructure for laboratory-based surveillance for foodborne diseases.

Recognizing the public health importance of foodborne diseases and the need to strengthen public health infrastructure globally, WHO Global Salm-Surv, a World Health Organization-sponsored program, was launched in 2000. WHO Global Salm-Surv is a capacity-building program that trains international microbiologists and epidemiologists on foodborne disease laboratory-based surveillance and outbreak detection and response through training courses and other program activities.

Founding members of WHO Global Salm-Surv included the World Health Organization, The Centers for Disease Control and Prevention (United States of America) and the Danish Institute for Food and Veterinary Research (Denmark). In recent years, additional partners have joined WHO Global Salm-Surv: Reseau International des Instituts Pasteur (France), Public Health Agency of Canada, Animal Sciences Group (Netherlands), Food and Drug Administration (United States of America), Enternet (European Union) and OzFoodNet (Australia).

WHO Global Salm-Surv Vision:

Foodborne and other infectious enteric diseases are a common cause of illness, disability and death worldwide. We believe they are preventable and therefore, place an unnecessary burden on society. Our vision is that all countries will prevent and control these diseases.

WHO Global Salm-Surv Mission:

To promote integrated, laboratory-based surveillance and foster intersectoral collaboration among human health, veterinary and food-related disciplines, thereby enhancing the capacity of countries to detect, respond to and prevent foodborne diseases.

Details about the WHO Global Salm-Surv Program, including descriptions of training and program activities, can be found at www.who.int/salmsurv/en.

In March 2006, the International Association for Food Protection participated at the Food Safety Summit in Las Vegas, NV. While exhibiting, we offered a drawing for a one-year Membership with our Association and a free registration to our Annual Meeting. We are pleased to announce the following winners of the drawing:

IAFP Membership

E. J. Bauman
DNV Certification
Newnan, GA

IAFP Annual Meeting Registration

Margaret Timm
Oregon Health and Science University
Portland, OR

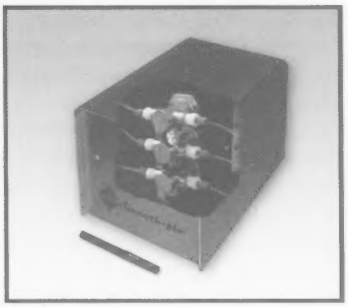
In Memory of...

Neil B. Webb
Raleigh, NC

IAFP would like to extend our deepest sympathy to the family and friends of Neil Webb who passed away in March 2006.

IAFP will always have sincere gratitude for his contributions to the Association and his profession.

INDUSTRY PRODUCTS



Fluid Metering, Inc.

Fluid Metering Precision Low Flow Pulseless Fluid Delivery System

Fluid Metering, Inc. has combined its patented CeramPump® No-Valve Fluid Control principle with their new phase-canceling technology to eliminate pulsation for continuous fluid metering down to extremely low flows of 5 µl/min. Previously, pulse-free metering, in the microliter range, relied solely on syringe pump technology.

The Smooth-flo® Fluid Delivery System is a fully programmable dispensing system which is controlled by precision stepper motors.

FMI's phase-canceling technology uses 3 separate valveless pump heads, uniquely timed, to eliminate pulsation. In addition, a second stepper motor adjusts the piston displacement which allows for fine adjustment to be made to the shot size by changing the stroke length.

The Smooth-flo® can be programmed for a variety of functions using a user-friendly touch screen interface which can control up to 16 systems on a single bus.

Up to 128 metering devices can be controlled using a PLC or computer. The Smooth-flo® will store up to 100 programs letting the user change between setups on the fly.

The system produces a pulse-free fluid delivery with 1% or better accuracy for millions of cycles.

Fluid Metering is certified as compliant with ISO 9001 quality standards. The Fluid Metering catalog details operating principles, pump capacities, motor characteristics, materials of construction, prices and ordering information.

Fluid Metering, Inc.
800.223.3388
Syosset, NY
www.fmipump.com

New Dual-indexing Bulk System from Gainco Improves Product Packing Operations

The new dual-indexing bulking and batching system from Gainco, Inc. is designed to optimize meat and poultry packing operations. Whether packing chicken tenders, boneless breasts, drumsticks, wings, leg quarters or chops, Gainco's new automated system delivers the highest degree of versatility, durability and cost-saving performance.

The ingenious labor-saving design of Gainco's dual-indexing bulk system is equipped with a "smart" conveyor that automatically indexes product containers following the bulk/batch cycle. Designed for optimal accuracy at high speeds, Gainco's dual load cell design improves settle time, thereby increasing accuracy and throughput – up to 980 pounds per minute (+/-14 cycles). Moreover, the system's unique "straddle" design with an in-line hopper greatly reduces the equipment footprint, thereby optimizing floor space.

Gainco's ability to construct individual system components according to multiple hardware and software configurations results in system designs that are ideally suited to the wide range of bulking applications needed by poultry processors. The systems can accommodate all popular sizes of totes, boxes or tubs.

Gainco's new dual-indexing bulk system is fully integrated with the company's DataMan™ online, real-time reporting system for data collection. Using either Ethernet or RF interfaces, managers are able to oversee production processes more efficiently and effectively with this application.

The new dual-indexing bulk system features Gainco's washdown-tough Infiniti Plus™ programmable controller, offering ease and flexibility in the product run setup and operation. This IP69K-rated weight indicator is specifically designed to thrive in the harshest food processing environments. Other features of the new bulk system include its innovative open-frame design as opposed to a conventional tubular construction. This open-frame design allows no place for food debris to hide or bacteria-prone residual water to collect, along with providing easier maintenance access. Moreover, the system is equipped with load cell overload protection to prevent damage and reduce long-term operating costs.

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The publishers do not warrant, either expressly or by implication, the factual accuracy of the products or descriptions herein, nor do they so warrant any views or opinions offered by the manufacturer of said articles and products.

Users of Gainco's dual-indexing bulk systems have access to Gainco's industry-leading Blue Ribbon Service program, wherein customers can receive expert 24-hour, 7-day service on all equipment components, distribution systems, software and wireless communications support. Blue Ribbon Service's customer service technicians are certified in most states, and all service work is guaranteed.

Gainco, Inc.
770.534.0703
Gainesville, GA
www.gainco.com

FKI Logistex Begins Manufacturing Its Hybrid AS/RS Cranes in the United States

FKI Logistex® announces that it is now manufacturing its hybrid automated-storage-and-retrieval (AS/RS) cranes in the United States at its plant in St. Louis, MO.

"It is incumbent upon FKI Logistex to provide the same high degree of service and support everywhere we do business. Our St. Louis manufacturing capability will provide North American customers with same level of manufacturing and technical support we have been providing from our UK-based facility — with the advantage of being closer to home," says Stephen Legg, director, product and technology development, FKI Logistex.

"Many of our North American customers are asking that our equipment be built stateside and with US parts to avoid the volatility of currency risk, to increase spare parts availability, and to reduce shipping costs," says Ken Matson, executive vice president, Manufacturing Systems, FKI Logistex North America. "Additionally, we have seen a trend in some markets that our equipment be specified with US parts to meet their manufacturing guidelines."

"This move shows our strong commitment to responding to these market requests," Matson adds. "We will be increasing our spare parts stock in St. Louis, supporting our cranes with a larger technical and manufacturing operation, and meeting the demands of our marketplace."

FKI Logistex has begun manufacturing a model of its Maestro™ crane in St. Louis as part of a large order for one of its US-based customers. The model has undergone an engineering conversion for local manufacture. The rest of the FKI Logistex crane product line, including all of the company's Condor™ units, will still be manufactured in the United Kingdom.

Once the semi-automatic Maestro models currently being manufactured are completed, automated versions will likely be built next, ramping up to units with different load handlers. A St. Louis-based manufacturing technical support team has been organized to provide support with an intimate knowledge of the new crane manufacture.

Approximately 70 percent of FKI Logistex cranes support distribution for retailers and manufacturers, while another 30 percent directly support manufacturing processes. FKI Logistex cranes are typically used in high-bay warehouses in AS/RS applications, where they take advantage of vertical space to reduce the need for costly warehouse floor space.

FKI Logistex
877.935.4564
St. Louis, MO
www.fkilogistex.com

Bilsom Upgrades Viking™ Series Earmuffs with Air Flow Control™ Technology

Bilsom has upgraded its popular Viking™ Series noise blocking earmuffs to incorporate its patented Air Flow Control™ technology (AFC), which delivers optimal attenuation across all frequencies without increasing earcup size or weight. Viking Series multi-position headbands give workers the flexibility to wear their earmuffs over-the-head, behind-the-head, or under-the-chin, allowing them to be worn with hard hats, face shields, respirators, and other PPE.

"Our Air Flow Control technology has proven so effective we're extending it to other products in the Bilsom® Noise Blocking earmuff segment," said Bill Sokol, vice president strategic marketing for the Bacou-Dalloz Hearing Safety Group. "As sound travels through the air in our AFC earcups, a patented baseplate chamber and high-tech non-woven layer manage the flow of air inside the earmuff to control how sound reaches the ear," Sokol explained. "The result is better, more consistent overall attenuation across all frequencies and in almost all industrial noise environments without increasing earcup size or weight."

Air Flow Control Technology has boosted attenuation on the V1 model from 23 to 25, and V2 model from 25 to 27. Attenuation on V3 remains at 29, though with improved lower frequency attenuation.

Designed to provide all-day comfort, Viking Series V2 and V3 earmuffs feature a dual-headband design with an inner ventilated band for better positioning and breathability, and a non-deforming outer headband that minimizes pressure on the head. An

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improved attached elastic headband strap provides additional comfort and helps to ensure attenuation when earmuffs are worn in other than over-the-head positions.

Snap-in ear cushions make replacement quick and easy, and dielectric construction with rugged ABS plastic makes Viking Series earmuffs suitable for almost all workplaces, and especially for electrical and mining environments.

Bacou-Dalloz Hearing Safety Group
800.430.5490
Smithfield, RI
www.hearingportal.com

A la Cart Introduces the DualTemp 120 Innovative Meal Delivery System for Cook-serve Hospital Operations

A la Cart, Inc. well known for its advanced systems that revolutionize meal quality, while allowing operations to reap more benefits with cook chill – now offers a groundbreaking solution for hospital operations that use conventional food preparation. The company is pleased to introduce DualTemp 120. It's a meal delivery cart and so much more!

Start with the fact that DualTemp can hold hot food hot indefinitely. And DualTemp really holds. In fact, after 30 minutes, meal quality just gets better, and safe food temperatures are maintained. Compare that to other conventional cook-serve heating systems (insulated base/pellet) available today. While they may hold food hot for 30 to 45 or 60 minutes, quality inevitably begins to decline at 30 minutes. And food safety becomes more questionable.

With DualTemp, the gentle heating source is the cart itself, on one side.

A la Cart, Inc.

The other side (DualTemp is divided into two compartments) has built-in refrigeration, so it also holds cold food and beverages cold – another major advantage of this remarkable new system from A la Cart.

Because DualTemp serves as both the heating/refrigeration system and the meal delivery cart, there are no bases and less pieces overall to deal with. Plus, no extra heating step is required at the trayline. DualTemp plugs in 15–30 minutes prior to tray assembly, and trays are simply loaded into pre-heated and cooled compartments. The cart can then be transported and plugged in on the floor to hold meals at ideal, consistent and HACCP-safe temperatures as long as needed. The DualTemp 120 cart plugs in to any 120 V/20 amp outlet, so it can be used virtually anywhere.

Dual Temp's hold-on-the-floor capability makes it especially beneficial for areas that require more serving flexibility, such as: birthing center, pediatrics and oncology; units where patients require assistance with feeding; and where the busy nursing staff is responsible for serving meals.

In addition to simplifying the heating/trayline/serving process, A la Cart's DualTemp 120 offers other benefits when it comes to efficiency and convenience. It virtually eliminates the need for late tray preparation. Late trays can be prepared with the regular trayline and kept in a DualTemp cart in the kitchen, where they remain ready to serve as soon as a patient is ready to eat.

DualTemp also allows operations to run traylines as much as an hour in advance, using conventional food preparation. That means no more "plating and running" to serve, before food cools down. If desired, all patients can be served at or close to (depending on hospital size) the same time. Delays in food preparation/trayline assembly will no longer cause delays in meal service.

Using DualTemp doesn't require one specific dishware type. Options include china, plastic or disposable for greater convenience, cost savings and flexibility in tray presentation. Finally, the DualTemp cart is compact and easy to maneuver, has easy-to-operate controls and holds up to 20 trays.

A la Cart, Inc.
800.762.2278
Charlotte, NC
www.alacartinc.com

Low Cost/High Performance Raman Systems from Lambda Solutions, Inc.

The remarkable 532nm Dimension-P2 Systems with resolution at 4 or 6 cm-1 is now available.

Though low cost, these units deliver unparalled sensitivity at an extremely high signal to noise ratio.

The Dimension-P2 systems are controlled with RamanSoft software, which automates data acquistion and

Be sure to mention, "I read about it in *Food Protection Trends*"!

processing and includes our patented background removal algorithm.

RamanSoft seamlessly integrates with GRAMS Sprectral ID® and IQ Predict® and is compliant with 21 CFR part 11 regulations.

Lambda Solutions, Inc.
781.478.0170
Waltham, MA
www.lambdasolutions.com

DNA-based Results for *Salmonella* in Less Than 24 Hours Now Available with the Assurance GDS System from BioControl

BioControl Systems, Inc., has announced the addition of *Salmonella* to its Assurance GDS™ (Genetic Detection System) platform. Assurance GDS combines the latest advancements in molecular technology and food microbiology to provide faster results with the increased accuracy required to meet today's food and environmental testing challenges.

Assurance GDS offers the first *Salmonella* method to provide accurate results in as few as 20 hours. "Customers can now get their *Salmonella* results an entire day faster with Assurance GDS than with most other rapid methods," states Phil Feldsine, president of BioControl. "This is an important advantage to customers holding product for release," says Feldsine.

In addition to faster results Assurance GDS also offers greater accuracy in the form of multiple layers of specificity. "Another key advantage that Assurance GDS has over other pathogen detection systems is that its design includes three levels of specificity," according to Geoff Bright, microbiology product manager. These include immunomagnetic separation (IMS), highly specific primers, and a patented probe system which ensure the highest degree of accuracy. "The multiple levels of specificity have enabled us to overcome matrix interference and cross reactivity; issues that are common to other genetic based systems. The benefit to customers being consistently, accurate results," says Bright.

Completing the system is the Assurance GDS Rotor-Gene, an innovative multi-channel rotary cycler for the amplification and detection of the target. The Assurance GDS Rotor-Gene can read multiple, distinct targets thereby eliminating the need for melt curves, which can be difficult and time consuming to interpret.

In addition to *Salmonella*, the Assurance GDS system includes assays for *E. coli* O157:H7 (AOAC Official Method 2005.04) and Shiga Toxin Genes (AOAC Official Method 2005.05). Assays for *Listeria* and *Listeria monocytogenes* are currently in development.

BioControl Systems, Inc.
425.603.1123 x137
Bellevue, WA
www.biocontrolsys.com

New UVC Portable Unit Provides In-room Decontamination from Steril-Aire

A new mobile decontamination unit equipped with multi-patented, high output UVC technology is now available from Steril-Aire. Called the "Remedial In-room Decontamination System (RIDS)," it provides a safe and effective way to decontaminate surfaces infested with mold (such as Stachybotrys and Aspergillus), viruses (e.g., colds, flu, SARS, bird or avian flu and measles); and bacteria (including TB, Legionella, *E. coli*, *Listeria*, *Salmonella* and whooping cough).

The user wheels the RIDS unit into the infested area, leaves the room and turns on the unit remotely, allowing the energy from the high output UVC Emitters to decontaminate walls, tabletops and other surfaces. A 12 x 12, area can typically be decontaminated in approximately 24 hours. Multiple RIDS units may be used to treat larger areas.

Steril-Aire UVC technology uses no chemicals, produces no ozone or other toxic contaminants, and minimizes worker exposure during the decontamination process. The high output UVC energy quickly kills or inactivates microorganisms that contribute to poor IAQ and/or the spread of infectious disease.

The portable RIDS unit is suitable for any type of residential, commercial, industrial or institutional building. Applications include residential and commercial surface mold remediation; food preparation and processing areas; surface decontamination in hospitals and health care facilities; and surface treatment in DNA laboratories to prevent cross-contamination.

Steril-Aire, Inc.
800.278.3745
Burbank, CA
www.steril-aire.com

AmeriVap™ Systems Introduces X treme Steam

Xtreme Steam (dry steam) generators for all your packaging lines, processing equipment, etc., can now be attached to new automatic conveyor belt cleaners for plastic and mesh belts. Plastic belts steam and extract simultaneously leaving belts sanitized and dry in one pass. All equipment totally portable, uses quarts per hour, not gallons per minute.

AmeriVap Systems, Inc.
404.350.0239
Atlanta, GA
www.amerivap.com

Be sure to mention, "I read about it in *Food Protection Trends*"!

IAFP 2006
93rd Annual Meeting
August 13-16
Calgary
Alberta Canada

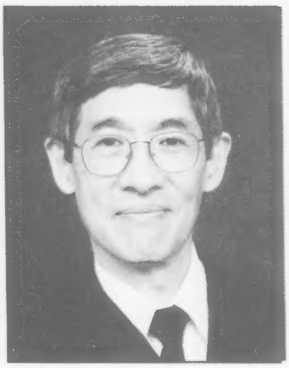
Ivan Parkin Lecture

Sunday, August 13
6:00 p.m.

"A Progress Paradox: If We Have the Safest Food Supply, Why Am I Working So Hard?"

Dr. Arthur P. Liang

Acting Associate Director for Food Safety
National Center for Zoonotic, Vectorborne, and Enteric Diseases
Centers for Disease Control and Prevention
Atlanta, Georgia



Dr. Arthur Liang is director of the Food Safety Office, at the Centers for Disease Control and Prevention, National Center for Infectious Diseases (CDC/NCID). He is a former CDC Epidemic Intelligence Service officer and former chief of the Communicable Disease Division at the Hawaii Department of Health. Dr. Liang currently serves on the Executive Committee of the National Advisory Committee on Microbiological Criteria for Foods (NACMCF) and is the CDC advisor to the Board of Directors of the Association of Food and Drug Officials (AFDO). He is also a member of the Preventive Medicine Residency Advisory Committee for the Walter Reed Army Institute of Research, a fellow and member of the Board of Regents of the American College of Preventive Medicine. He is board certified in General Preventive Medicine and Public Health. Dr. Liang earned his BA from Oberlin College, an MPH in International Health and Epidemiology from the University of Hawaii, and his MD from the University of Maryland.

Join us at the Wine and Cheese Reception in the Exhibit Hall following the Ivan Parkin Lecture.

(The Wine and Cheese Reception is sponsored by Kraft Foods)

John H. Silliker Lecture

Wednesday, August 16
3:45 p.m.

"Rising From the Ocean Bottom – The Evolution of Microbiology in the Food Industry"

Dr. William H. Sperber

Senior Corporate Microbiologist

Cargill, Inc.

Wayzata, Minnesota

On a wintry Wisconsin afternoon in 1941, a future microbiologist drew his first breath and cried, "I hope you washed your hands!" Some years later, after completing undergraduate majors in zoology and chemistry, William Sperber earned his M. S. (1967) and Ph.D. (1969) degrees in microbiology from the University of Wisconsin at Madison. In his subsequent employment with major food companies he has become one of the world's experts in designing and controlling the microbiological safety and quality of foods.

Several of Dr. Sperber's innovations in graduate school were the development of M-Broth and the Enrichment-Serology procedure for *Salmonella* detection, which became a forerunner of ELISA-based technologies. At Best Foods in 1970, twelve years before the Tylenol® incident, he led the development of the first tamper-evident packaging feature for a consumer food product. Hired in 1972 to conduct the first hazard analyses for consumer food products in Pillsbury's novel HACCP system, Dr. Sperber led Pillsbury's microbiology and food safety programs until 1995. At that time he joined Cargill, where he remains employed today on a post-retirement basis as Senior Corporate Microbiologist and "Global Ambassador for Food Safety," promoting principles of food safety and public health, beginning with the most important principle, "Wash Your Hands!"

A former chair of the IFT Division of Food Microbiology and the Food Microbiology Research Conference, Dr. Sperber was appointed five times by the US Secretary of Agriculture to the National Advisory Committee on Microbiological Criteria for Foods. The author of numerous publications and presentations, he is currently developing several book chapters and co-editing a new Compendium on the Microbiological Spoilage of Foods and Beverages, still "trying to make the world safer for people who eat." Bill and his wife, Renate, enjoy gardening, bicycling, books, music, and travel.

IAFP 2006 Preliminary Program

SUNDAY, AUGUST 13

Opening Session – 6:00 p.m.–7:00 p.m.

- Ivan Parkin Lecturer – Arthur Liang, Ph.D., CDC, Atlanta, GA, USA

MONDAY, AUGUST 14

Morning – 8:30 a.m. – 12:00 p.m.

Symposium Topics

- Making Foods Safer: How Outbreaks Can Influence Change
- Surrogate Microorganisms: Selection, Use and Validation
- The Canadian Approach to Food Safety
- Verification of Sanitary Design of Food Equipment
- Practical Application of Risk Assessment Tools in the Food Industry

Technical Session

- Applied Laboratory Methods and Meat and Poultry

Poster Session (9:30 a.m. – 1:30 p.m.)

- Food Toxicology, Education and General Microbiology

Afternoon – 1:30 p.m. – 5:00 p.m.

Symposium Topics

- Foodborne Viruses and Foodborne Viral Infections: Disease Burden, Epidemiology, Detection and Transmission
- Spores, Spores, and More Spores…What is Spoiling My Ready-to-Drink (RTD) Beverage? Is It *Alicyclobacillius* or Heat Resistant Mold?
- Biosecurity at Retail

Round-Table Topics

- Issues Regarding Raw Milk Sales and Consumption
- Refrigertated Ready-to-Eat (RTE) Foods: Microbiological Concerns and Control Measures

Technical Session

- Education and Dairy

Poster Session (2:00 p.m. – 6:00 p.m.)

- Dairy, Meat and Poultry

TUESDAY, AUGUST 15

Morning – 8:30 a.m. – 12:00 p.m.

Symposium Topics

- Disaster Preparedness and Response
- Symposium on *Enterobacter sakazakii*
- *Campylobacter* – From Gate to Plate
- Hygiene and Sanitation Solutions to Manage Evolving Risks
- International Food Law–A Global Overview

Technical Session

- Pathogens and Antimicrobials

Poster Session (9:30 a.m. – 1:30 p.m.)

- Seafood and Applied Laboratory Methods

Afternoon – 12:15 p.m. – 1:00 p.m.

- IAFP Business Meeting

Afternoon – 1:30 p.m. – 5:00 p.m.

Symposium Topics

- Foodborne Disease Update
- Contamination of Ready-to-Eat (RTE) Foods: Transfer and Risk–*Listeria monocytogenes* and Other Microorganisms
- Role and Application of International Standards in Supporting Food Safety Management and Testing
- A New Crack at Egg Safety: From the Hen House to Your House
- Cleaning and Sanitation for Retail Food Safety–Identifying the Issues

Technical Session

- Risk Assessment and Epidemiology

Poster Session (2:00 p.m. – 6:00 p.m.)

- Pathogens and Produce

WEDNESDAY, AUGUST 16

Morning – 8:30 a.m. – 12:00 p.m.

Symposium Topics

- Aftermath of Hurricane Katrina and Rita on Seafood Safety
- Assuring Microbiological Safety of Organic Products
- Symposium on *Salmonella*: The Saga Continues

Technical Sessions

- Education
- Pathogens and Antimicrobials–*Listeria*

Poster Session (9:30 a.m. – 1:30 p.m.)

- Risk Assessment and Antimicrobials

Afternoon – 1:30 p.m. – 3:30 p.m.

Symposium Topics

- How Risk Managers Decide on Risk from Different National Perspectives
- Symposium on Food Allergen Control at Retail and Foodservice
- Quality Control in Research Labs

Round-Table Topic

- Water Safety and Quality: Global Water – HACCP Issues

Technical Session

- Produce

Afternoon – 3:45 p.m. – 4:30 p.m.

- John H. Silliker Lecturer – "Rising From the Ocean Bottom – The Evolution of Microbiology in the Food Industry" – William Sperber, Ph.D., Cargill, Wayzata, MN, USA

Subject to change

IAFP 2006 Networking Opportunities

IAFP FUNCTIONS

WELCOME RECEPTION–*Hyatt Regency Calgary*
Saturday, August 12 • 4:30 p.m. – 5:30 p.m.
Sponsored by Orkin Commercial Services

Welcome to IAFP 2006 and to the beautiful city of Calgary. Reunite with colleagues from around the world as you socialize and prepare for the leading food safety conference. Everyone is invited!

AFFILIATE RECEPTION–*Hyatt Regency Calgary*
Saturday, August 12 • 5:30 p.m. – 7:00 p.m.

Affiliate Officers and Delegates plan to arrive in time to participate in this educational reception. Watch for additional details.

COMMITTEE MEETINGS–*Hyatt Regency Calgary*
Saturday, August 12 • 1:00 p.m. – 5:00 p.m.
Sunday, August 13 • 7:00 a.m. – 5:00 p.m.
Refreshments Sponsored by Springer New York LLC

Committees and Professional Development Groups (PDGs) plan, develop and institute many of the Association's projects, including workshops, publications, and educational sessions. Share your expertise by volunteering to serve on any number of committees or PDGs. Everyone is invited to attend.

STUDENT LUNCHEON–*Hyatt Regency Calgary*
Sunday, August 13 • 12:00 p.m. – 1:30 p.m.
Sponsored by Texas A&M Agriculture, Department of Animal Science, Food Safety

The mission of the Student PDG is to provide students of food safety with a platform to enrich their experience as Members of IAFP. Sign up for the luncheon to help start building your professional network.

EDITORIAL BOARD RECEPTION–*Hyatt Regency Calgary*
Sunday, August 13 • 4:30 p.m. – 5:30 p.m.
Editorial Board Members are invited to this reception to be recognized for their service during the year.

OPENING SESSION AND IVAN PARKIN LECTURE–*Telus Convention Centre*
Sunday, August 13 • 6:00 p.m. – 7:00 p.m.

Join us to kick off IAFP 2006 at the Opening Session. Listen to the prestigous Ivan Parkin Lecture delivered by Dr. Arthur Liang.

CHEESE AND WINE RECEPTION–*Telus Convention Centre*
Sunday, August 13 • 7:00 p.m. – 9:00 p.m.
Sponsored by Kraft Foods

An IAFP tradition for attendees and guests. The reception begins in the Exhibit Hall immediately following the Ivan Parkin Lecture on Sunday evening.

IAFP JOB FAIR–*Telus Convention Centre*
Sunday, August 13 through Wednesday, August 16

Employers, take advantage of recruiting the top food scientists in the world! Post your job announcements and interview candidates.

COMMITTEE AND PDG CHAIRPERSON BREAKFAST (By invitation)–*Hyatt Regency Calgary*
Monday, August 14 • 7:00 a.m. – 9:00 a.m.

Chairpersons and Vice Chairpersons are invited to attend this breakfast to report on the activities of your committee.

EXHIBIT HALL LUNCH – *NEW!* –*Telus Convention Centre*
Monday, August 14 • 12:00 p.m. – 1:00 p.m.
Sponsored by JohnsonDiversey
Tuesday, August 15 • 12:00 p.m. – 1:00 p.m.
Sponsored by SGS North America

Stop in the Exhibit Hall for lunch and business on Monday and Tuesday.

EXHIBIT HALL RECEPTIONS–*Telus Convention Centre*
Monday, August 14 • 5:00 p.m. – 6:30 p.m.
Sponsored by DuPont Qualicon
Tuesday, August 15 • 5:00 p.m. – 6:00 p.m. – ***NEW!***

Join your colleagues in the Exhibit Hall to see the most up-to-date trends in food safety techniques and equipment. Take advantage of these great networking receptions.

PRESIDENT'S RECEPTION (By invitation)–*Hyatt Regency Calgary*
Monday, August 14 • 6:30 p.m. – 7:30 p.m.
Sponsored by Fisher Scientific

This by invitation event is held each year to honor those who have contributed to the Association during the year.

PAST PRESIDENTS' DINNER (By invitation)–*Hyatt Regency Calgary*
Monday, August 14 • 7:30 p.m. – 10:00 p.m.

Past Presidents and their guests are invited to this dinner to socialize and reminisce.

BUSINESS MEETING–*Telus Convention Centre*
Tuesday, August 15 • 12:15 p.m. – 1:00 p.m.

You are encouraged to attend the Business Meeting to keep informed of the actions of YOUR Association.

JOHN H. SILLIKER LECTURE–*Telus Convention Centre*
Wednesday, August 16 • 3:45 p.m. – 4:30 p.m.

The John H. Silliker Lecture will be delivered by Dr. William H. Sperber.

AWARDS BANQUET–*Hyatt Regency Calgary*
Wednesday, August 16 • 7:00 p.m. – 9:30 p.m.

Bring IAFP 2006 to a close at the Awards Banquet. Award recipients will be recognized for their outstanding achievements and the gavel will be passed from Dr. Jeffrey Farber to Incoming President Frank Yiannas, M.P.H.

IAFP 2006 Event Information

EVENING EVENTS

NEW – IAFP Foundation Fundraisers

Murder Mystery Dinner at the Deane House
Tuesday, August 15 • 6:30 p.m. – 10:00 p.m.

A short ride from downtown Calgary leads to The Deane House located in the Fort Calgary interpretive site. Nestled on the banks of the Elbow River, the house has maintained its historical authenticity and is a perfect setting for relaxed, casual dining.

The Deane House Mystery from History is a unique, interactive dinner theatre. Characters from the past play out a mystery, loosely based on local history while guests play detective, trying to figure out "who dunnit." During Act I, enjoy a leisurely cocktail in the Captain's Room while the characters mingle with the crowd. The Narrator explains the rules of the game, how the evening will proceed and makes formal introductions. Guests then move to the main dining room where Act II unfolds during soup and salad service… and concludes with a murder. After a sumptuous entrée, explore the house, eaves-dropping and listening for further clues. As the curtain comes down on Act III, return to the dining room where dessert is served. At this point "guesses" are revealed and the murder is solved.

Dinner at The Ranche
Tuesday, August 15 • 6:30 p.m. – 10:00 p.m.

The flavors and traditions of Alberta's ranching heritage live on at The Ranche Restaurant. Originally built in 1886 by William Roper Hull as the headquarters of The Bow Valley Ranche, it was sold in 1902 to Patrick Burns, one of the founding members of the Calgary Stampede. This intriguing historic house was once one of Southern Alberta's grandest private residences and today it is home to one of Calgary's finest and most creative restaurants – a unique setting within the city.

Located in Fish Creek Provincial Park, the Ranche is acclaimed for its commitment to exceptional dining experiences. Executive Chef Alistair Barnes and his team offer discriminating dinners, fresh baked bread, the finest meat, poultry and fish, naturally raised game (from their own game ranch!), fresh vegetables and mouth-watering desserts.

A portion of your registration fee from the two IAFP Foundation Fundraising activities will be donated to the Foundation.

GOLF TOURNAMENT

Golf Tournament at The Links of GlenEagles
Saturday, August 12 • 7:30 a.m. – 4:00 p.m.

Join your friends and colleagues for a relaxing round of golf, Canadian Rocky style, before IAFP 2006. From the very first tee at The Links of GlenEagles, you know you've made the right choice for your day of golf. On every hole there are panoramic Rocky Mountain views as a backdrop to one of Canada's most superb golf courses. At The Links of GlenEagles you will find a pristine course – lush green fairways, the brilliant white sand bunkers and exciting changes in elevation.

Designer Les Furber, one of Canada's greatest golf designers, carved this course into the rugged foothills just as they run up to the Rocky Mountains. Portions of the course run along a cliff some 200 feet above the Bow River Valley. The course offers a grand visual experience as well as a golfing adventure. It's a round you will talk about for months afterward.

Price includes transportation, greens fees with cart, range balls, lunch and prizes.

DAYTIME TOURS

The Best of Lake Louise and Banff
Saturday, August 12 • 8:00 a.m. – 5:00 p.m.

For over a century, explorers have been making the trip to the incredible towering mountain peaks and icy blue glaciers, which are the highlights of Banff National Park. As you depart the urban city of Calgary, you will pass through the rolling wheat fields and into the foothills before entering the majestic beauty of the Canadian Rockies. Once in Banff National Park, the journey continues along the winding Bow Valley Parkway passing Hole-in-the-Wall, Johnston Canyon and magnificent Castle Mountain. At Lake Louise, enjoy free time to discover this special place with outdoor pursuits: hike, rent a canoe, or try horseback riding. If you prefer, the Fairmont Chateau Lake Louise has various shops, lounges, restaurants, and fabulous architecture that will impress for hours. The rich history and beauty of Lake Louise will last in memory for years to come! Rejoin the group to enjoy a delicious lunch before departing the Chateau for the second half of the tour.

The next part of the adventure in the Rockies leads to beautiful Banff! This tour features the spray of cool waterfalls, an optional ascent up a mountain, a taste of local history and a chance to spy on wildlife – complete in one afternoon! To start, feel the power of the Bow Falls and the beauty that surrounds it just below the Fairmont Banff Springs Hotel. Continue exploring some of the best views in town – Surprise Corner on Tunnel Mountain Drive, the Hoodoos (oddly shaped pillars of glacial rock) and Mount Norquay's winding road. Next stop at the Cave and Basin Centennial Center – the birthplace of Canada's national parks where the guide will provide interesting tidbits on Banff's rich natural and human history. Before returning to Calgary, enjoy some free time to explore the many unique cafes, boutiques, and shops in downtown Banff or take a relaxing stroll through the tranquil Cascade gardens.

Optional: For those not wanting to stop downtown, the coach will continue on to Sulphur Mountain where guests can take the gondola up to the 7,500 foot summit of the mountain and enjoy a panoramic view of the entire Bow Valley as well as explore the interpretive trail that winds atop the mountain. Gondola admission is not included in the tour price.

The Complete Calgary Tour

Sunday, August 13 • 10:00 a.m. – 4:00 p.m.

Spend today exploring the exciting attractions of Calgary. This thriving business center combines the friendly atmosphere of the old west with the aggressive style of a modern cosmopolitan center. The day will be highlighted by stops at historical locations, unique neighborhoods and scenic viewpoints. Start at the Calgary Tower that features spectacular views of Calgary and the Canadian Rockies as well as a new glass floor attraction. Visit Heritage Park where the sights and sounds of Canada's exciting pioneer west has been recreated; enjoy a tour onboard an authentic steam train followed by lunch in one of the historical buildings. Last, make a stop at Canada Olympic Park, an internationally-renowned winter training facility and home to the world's largest Olympic Hall of Fame!

Drumheller and the Badlands

Monday, August 14 • 8:00 a.m. – 4:00 p.m.

Wind whines through the stubble of brush over a dry valley, its whispers joined only by the incessant creaking of crickets and the occasional clacking of grasshoppers' wings. This is the Badlands of Alberta! As the landscape changes, you will feel as though you've stepped back in time – way back to prehistoric time! The highlight of this tour will be at the Royal Tyrrell Museum of Paleontology in Drumheller. This museum is a major exhibition and research center, and one of the largest paleontological museums in the world. It displays more than 200 dinosaur specimens, the largest number under one roof anywhere. Most of the dinos on display were found in Alberta; the majority just outside in Dinosaur Provincial Park and Drumheller. Following a tour of the museum, enjoy the unique landscape of some of the many self-guided trails and a leisurely lunch.

Art Walk

Tuesday, August 15 • 10:00 a.m. – 1:30 p.m. (Lunch not included)

Downtown Calgary isn't all concrete and glass – it's also home to some of Calgary's best-known art galleries. These gems will be explored on a walking tour of downtown. Stops will include the Stephen Lowe Art Gallery featuring Western and Asian fine art paintings and sculptures by more than 65 artists; Diana Paul Galleries, where some of Canada's most renowned contemporary impressionists are featured; Gainsborough Galleries, opened in 1923, the longest-running art gallery in the city; and Wallace Galleries, representing accomplished Canadian and international contemporary visual artists.

The tour will end at Art Central – Calgary's newest addition to the art scene, with three floors of bright open space housing art galleries and artists studios. A short tour highlighting the main attractions on each floor will be followed by a demonstration in one of the artist's studios.

Following the tour, explore Art Central, enjoy a delicious lunch (not included) in one of the trendy downtown restaurants, or continue exploring Calgary's artistic offerings.

Yoga and Cooking Class

Wednesday, August 16 • 9:45 a.m. – 2:00 p.m.

Today is dedicated to the issues of health and vitality that are so prevalent in the Western Canada lifestyle. Start the day with a private session at one of the trendy downtown yoga studios. The local instructor will lead an hour-long vinyasa yoga class. This popular form of yoga focuses on integrating breath and movement, awareness and alignment, and strength and flexibility in daily life. The result is improved circulation, a light and strong body, and a calm mind.

After class, depart for the Cookbook Company, Calgary's culinary hub. The culinary classroom plays host to over 200 cooking classes, wine classes, specialty dinners and workshops each year. The body and mind theme will be carried forward into this culinary adventure with the cooking of a delicious and healthy vegetarian lunch with the local yoga and cooking guru.

POST MEETING ACTIVITY

Outdoor Adventure in Kananaskis

Thursday, August 17 • 8:30 a.m. – 2:30 p.m.

Welcome to the REAL WEST! Transfer by exclusive coach to Kananaskis Country for a morning of activities in the beautiful Canadian Rockies.

Tucked away in the spectacular Kananaskis Valley, Boundary Ranch is the perfect setting for an Alberta Barbecue. Lunch at Boundary Ranch offers the opportunity to relax and watch the trail rides leave the corral, get involved in activities like horseshoes or roping or take a picturesque stroll through the mountains surrounding the ranch. There is always a lot to see and do! Wander through the unique log and cedar facilities and enjoy western hospitality at its finest! Consider the additional activities offered for a small fee. Optional activities:

Biking in Kananaskis
Voyageur Canoe Ride
Kananaskis Hiking Tours
Horseback Trail Ride at Boundary Ranch
Whitewater Rafting on the Kananaskis River

IMPORTANT! Please read this information before completing your registration form.

MEETING INFORMATION

Register to attend the world's leading food safety conference.

Full Registration includes:

- Technical Sessions
- Symposia
- Poster Presentations
- Ivan Parkin Lecture
- John H. Silliker Lecture
- Exhibit Hall Lunch (Mon.-Tues.)
- Awards Banquet
- Exhibit Hall Admittance
- Cheese and Wine Reception
- Exhibit Hall Reception (Mon.-Tues.)
- Program and Abstract Book

4 EASY WAYS TO REGISTER

Complete the Attendee Registration Form and submit it to the International Association for Food Protection by:

Online: www.foodprotection.org

Fax: 515.276.8655

Mail: 6200 Aurora Avenue, Suite 200W
Des Moines, IA 50322-2864, USA

Phone: 800.369.6337; 515.276.3344

The early registration deadline is July 12, 2006. After this date, late registration fees are in effect.

REFUND/CANCELLATION POLICY

Registration fees, less a $50 administration fee and any applicable bank charges, will be refunded for written cancellations received by July 28, 2006. No refunds will be made after July 28, 2006; however, the registration may be transferred to a colleague with written notification. Refunds will be processed after August 23, 2006. Event and tour tickets purchased are nonrefundable.

International Association for Food Protection®

EXHIBIT HOURS

Sunday, August 13, 2006	7:00 p.m. – 9:00 p.m.
Monday, August 14, 2006	9:30 a.m. – 6:30 p.m.
Tuesday, August 15, 2006	9:30 a.m. – 6:00 p.m.

DAYTIME EVENTS – Lunch included

Saturday, August 12, 2006	8:00 a.m. – 5:00 p.m.
The Best of Lake Louise and Banff	
Sunday, August 13, 2006	10:00 a.m. – 4:00 p.m.
The Complete Calgary Tour	
Monday, August 14, 2006	8:00 a.m. – 4:00 p.m.
Drumheller and the Badlands	
Tuesday, August 15, 2006	10:00 a.m. – 1:30 p.m.
Art Walk (Lunch not included)	
Wednesday, August 16, 2006	9:45 a.m. – 2:00 p.m.
Yoga and Cooking Class	

EVENING EVENTS

Sunday, August 13, 2006

Opening Session	6:00 p.m. – 7:00 p.m.
Cheese and Wine Reception *Sponsored by Kraft Foods*	7:00 p.m. – 9:00 p.m.

Monday, August 14, 2006

Exhibit Hall Reception *Sponsored by DuPont Qualicon*	5:00 p.m. – 6:30 p.m.

Tuesday, August 15, 2006

Exhibit Hall Reception	5:00 p.m. – 6:00 p.m.

NEW – IAFP Foundation Fundraisers

Murder Mystery Dinner at the Deane House	6:30 p.m. – 10:00 p.m.
Dinner at The Ranche	6:30 p.m. – 10:00 p.m.

Wednesday, August 16, 2006

Awards Banquet Reception	6:00 p.m. – 7:00 p.m.
Awards Banquet	7:00 p.m. – 9:30 p.m.

POST MEETING ACTIVITY

Thursday, August 17, 2006

Outdoor Adventure in Kananaskis	8:30 a.m. – 2:30 p.m.

GOLF TOURNAMENT

Saturday, August 12, 2006

Golf Tournament at The Links of GlenEagles	7:30 a.m. – 4:00 p.m.

HOTEL INFORMATION

Hotel reservations can be made online at www.foodprotection.org. See page 347 for additional hotel information.

IAFP 2006 Registration Form

International Association for Food Protection
6200 Aurora Avenue, Suite 200W
DesMoines,IA 50322-2864USA
Phone: 800.369.6337 ¥ 515.276.3344
Fax: 515.276.8655
E-mail: info@foodprotection.org
Web site: www.foodprotection.org

Member Number: _____

First name (as it will appear on your badge) _____ Last name _____

Employer _____ Title _____

Mailing Address (Please specify: ❒ Home ❒ Work) _____

City _____ State/Province _____ Country _____ Postal/Zip Code _____

Telephone _____ Fax _____ E-mail _____

❒ Regarding the ADA, please attach a brief description of special requirements you may have.

❒ IAFP occasionally provides Attendees' addresses (excluding phone and E-mail) to vendors and exhibitors supplying products and services for the food safety industry. If you prefer NOT to be included in these lists, please check the box.

PAYMENT MUST BE RECEIVED BY JULY 12, 2006 TO AVOID LATE REGISTRATION FEES

REGISTRATION FEES:	MEMBERS	NONMEMBERS	TOTAL
Registration	$ 395 ($ 445 late)	$ 597 ($647 late)	
Association Student Member	$ 80 ($ 90 late)	Not Available	
Retired Association Member	$ 80 ($ 90 late)	Not Available	
One Day Registration* ❒ Mon. ❒ Tues. ❒ Wed.	$ 215 ($ 240 late)	$ 330 ($355 late)	
Spouse/Companion* (Name): _____	$ 55 ($ 55 late)	$ 55 ($ 55 late)	
Children 15 & Over* (Names): _____	$ 25 ($ 25 late)	$ 25 ($ 25 late)	
Children 14 & Under* (Names): _____	FREE	FREE	
*Awards Banquet not included			
Additional Awards Banquet Ticket (Wednesday, 8/16)	$ 50 ($ 60 late)	$ 50 ($ 60 late)	
Student Luncheon (Sunday, 8/13)	$ 5 ($ 15 late)		
NEW IAFP FOUNDATION FUNDRAISERS:		# OF TICKETS	
Tuesday, 8/15			
Murder Mystery Dinner at the Deane House	$ 130 ($140 late)		
Dinner at The Ranche	$ 145 ($155 late)		
DAYTIME EVENTS – Lunch included			
Golf Tournament (Saturday, 8/12)	$ 135 ($145 late)		
The Best of Lake Louise and Banff (Saturday, 8/12)	$ 130 ($140 late)		
The Complete Calgary Tour (Sunday, 8/13)	$ 105 ($115 late)		
Drumheller and the Badlands (Monday, 8/14)	$ 115 ($125 late)		
Art Walk – Lunch not included (Tuesday, 8/15)	$ 42 ($ 52 late)		
Yoga and Cooking Class (Wednesday, 8/16)	$ 90 ($100 late)		
Outdoor Adventure in Kananaskis (Thursday, 8/17)	$ 82 ($ 92 late)		
Optional: Select one activity per person		Qty.	
❒ Biking	$ 93 ($103 late)		
❒ Canoe Ride	$ 56 ($ 66 late)		
❒ Hiking	$ 51 ($ 61 late)		
❒ Horseback Riding	$ 57 ($ 67 late)		
❒ Rafting	$ 61 ($ 71 late)		

PAYMENT OPTIONS: ❒ VISA ❒ MasterCard ❒

TOTAL AMOUNT ENCLOSED $_____
US FUNDS on US BANK

❒ Check Enclosed

Credit Card #_____

Expiration Date _____

Name on Card _____

Signature _____

JOIN TODAY AND SAVE!!!
(Attach a completed Membership application)

❒ Check box if you are a technical, poster, or symposium speaker.

EXHIBITORS DO NOT USE THIS FORM

IAFP 2006 Workshops

WORKSHOP 1	WORKSHOP 2	WORKSHOP 3
Saturday, August 12 8:00 a.m. to 5:00 p.m.	**Saturday, August 12** 8:00 a.m. to 5:00 p.m.	**Friday, August 11** **Saturday, August 12** 8:00 a.m. to 5:00 p.m.
Developing and Improving Your Food Microbiology Laboratory	***Methods, Methods Everywhere but Which is Right for Me? Selection and Verification of Methods***	***Global Food Standards: Food Safety Auditing***

Workshop 1 – Developing and Improving Your Food Microbiology Laboratory

This workshop will present ways to operate a food microbiology laboratory more effectively and efficiently. You will learn in a friendly and interactive environment, the critical elements of a food microbiology testing laboratory. Also, laboratory layout as it applies to efficiency and data quality will be addressed. Workshop participants will learn how to build technical competence through training and the three pillars of quality. Analysis of variables to be considered when determining whether to build or up grade an internal microbiology laboratory including a review of experiences and challenges with in-house testing will be presented. The workshop will include time for a round-table discussion and a binder of information to reinforce the practical experience gained during the workshop for future use.

Topics:

- Critical Elements of Food Microbiology Testing Laboratories
- Building Technical Competency: Training and the Three Pillars of Quality
- Laboratory Layout Considerations
- Developing an In-House Microbiology Laboratory? Factors to Consider

Intended Audience

Laboratory personnel or microbiologists in small to medium sized laboratories or companies

Instructors:

Donna Christensen, Canadian Food Inspection Agency, Calgary, Alberta, Canada
Dave Evanson, Silliker Inc., Homewood, IL, USA
Timothy Freier, Cargill Corporate Food Safety and Regulatory Affairs, Minneapolis, MN, USA
Jeffrey Kornacki, Ph.D., Kornacki Food Safety Associates, LLC, McFarland, WI, USA

Organizers:

Jeffrey Kornacki, Ph.D., Kornacki Food Safety Associates, LLC, McFarland, WI, USA
Pamela Wilger, M.S., Cargill, Wayzata, MN, USA

Workshop 2 – Methods, Methods Everywhere but Which is Right for Me? Selection and Verification of Methods

Selecting the analytical tool(s) for microbiological analysis that best meets your needs is a critical task. With so many choices, how do you decide? This workshop will teach you everything that you ever wanted to know about selecting a microbiological method that is "fit for purpose." You will experience a demonstration of an AOAC "on-line" learning center and get a better understanding of the various international approaches to method validation schemes. Speakers will address practical considerations in method selection both for large corporate labs, as well as for single manufacturing site labs. The concept of uncertainty of measurement as a key component of method verification will be addressed from a microbiologist's viewpoint. Using the Mexican and Canadian experiences, expectations of accrediting authorities for method verification will also be detailed. There will be ample time provided for open discussion and each of the presentations will include a list of available resources to help the attendees with the decision making process.

Topics:

- Worldwide Method Validation – Have It Your Way – The AOAC RI Learning Center Approach
- Death, Taxes and Uncertainty…A Simple Microbiologist's View
- How to Choose a Method: Practical Considerations
- Expectations of an Accrediting Body – A Canadian Perspective
- Expectations of an Accrediting Body – A Mexican Perspective

Instructors:

Michael Brodsky, Brodsky Consultants, Thornhill, Ontario, Canada
Donna Christensen, Canadian Food Inspection Agency, Calgary, Alberta, Canada
Armida Zuniga-Estrada, Public Health State Laboratory, Pachuca City, Hidalgo, Mexico
Robin Kalinowski, National Center for Food Safety and Technology, Summit Argo, IL, USA
Deborah McKenzie and Maria Nelson, AOAC Research Institute, Gaithersburg, MD, USA

Organizers:

Christine Aleski, Ann Arbor, MI, USA
George Wilson, BD Diagnostics, Sparks, MD, USA

Intended Audience

Microbiologists, Lab supervisors and managers, QA personnel and analysts or anyone responsible for selecting laboratory methods in a food production, processing or analytical environment

Workshop 3 – Global Food Standards: Food Safety Auditing

In today's global food market it is vital that there are food safety standards in place that can be used by companies in determining a supplier base for their foodstuffs. To this end there has been an increase in the development and evolution of Global Food Safety Standards. The recently launched ISO 22000 Standard is the latest in the range of standards. Currently, the most widely used is the British Retail Consortium (BRC) Global Standard–Food. This is used by approved Certification Bodies as the standard to audit against in ensuring a consistent, safe food supply. The Standard covers a wide range of topics including, HACCP, Quality Management Systems, Factory Environment Standards, Product Control, Process Control and Personnel. One of the problems with auditing is ensuring consistency between auditors. This workshop will cover all aspects of both the Standard and auditing techniques to guarantee consistency.

This course is certified by the British Retail Consortium and is recognized as the required Internal Auditor training for any company seeking certification. Successful delegates will receive a recognized certificate.

Topics:

- Summary of the standard
- Global food standard audit concepts
- Types of audit
- The auditor
- Auditor skills
- Audit report writing
- Reporting audit results to management

Instructors:

Gordon Hayburn, University of Wales Institute, Cardiff, UK
Louise Fielding, University of Wales Institute, Cardiff, UK
David Lloyd, University of Wales Institute, Cardiff, UK

Organizer:

Gordon Hayburn, University of Wales Institute, Cardiff, UK

Intended Audience

Quality/Technical managers, Internal Systems auditors, consultants, food safety professionals and academics

IAFP 2006 Workshop Registration Form

❑ **Workshop 1 – *Developing and Improving Your Food Microbiology Laboratory* – Saturday, August 12**

❑ **Workshop 2 – *Methods, Methods Everywhere but Which is Right for Me? Selection and Verification of Methods* – Saturday, August 12**

❑ **Workshop 3 – *Global Food Standards: Food Safety Auditing* – Friday and Saturday, August 11–12**

First Name (will appear on badge)

Last Name

Company | Job Title

Address | City

State/Province | Country | Postal Code/Zip +4

Area Code & Telephone | Fax

E-mail | Member #

❑ **Check Enclosed** ❑ VISA ❑ ❑ MasterCard

Account Number **Total Amount Enclosed** (US Funds on US Bank) $

Signature **Expiration date**

• REGISTRATION •

Payment must be received by July 21, 2006 to avoid late registration rates.

WORKSHOP 1

	Early Rate	Late Rate
IAFP Member	$295.00	$370.00
NonMember	$395.00	$470.00

WORKSHOP 2

	Early Rate	Late Rate
IAFP Member	$320.00	$395.00
NonMember	$420.00	$495.00

WORKSHOP 3

	Early Rate	Late Rate
IAFP Member	$465.00	$540.00
NonMember	$565.00	$640.00

GROUP DISCOUNT:
Register 3 or more people from your company and receive a 15% discount. Registrations must be received as a group.

Refund/Cancellation Policy

Registration fees, less a $50 administrative charge, will be refunded for written cancellations received by July 28, 2006. No refunds will be made after that date; however, the registration may be transferred to a colleague with written notification. Refunds will be processed after August 21, 2006. The workshop may be cancelled if sufficient enrollment is not received by July 21, 2006.

For further information, please contact the Association office at 800.369.6337; 515.276.3344; Fax: 515.276.8655; E-mail: jcattanach@foodprotection.org.

• 4 Easy Ways to Register •

To register, complete the Workshop Registration Form and submit it to the International Association for Food Protection by:

Online: **www.foodprotection.org**

Phone: 800.369.6337; 515.276.3344

Fax: 515.276.8655

Mail: 6200 Aurora Avenue, Suite 200W, Des Moines, IA 50322-2864, USA

REQUEST FOR ACCOMMODATIONS

INTERNATIONAL ASSOCIATION FOR FOOD PROTECTION
93rd ANNUAL MEETING
August 13 - 16, 2006
Calgary, Alberta, Canada

INSTRUCTIONS

Online housing will open on **December 1, 2005.**

INTERNET:
Visit the International Association for Food Protection website at **www.foodprotection.org** to make your reservation.

FAX:
Only fully completed forms will be accepted by fax at **403-262-3809**. Use one form per individual request.

MAIL:
Housing forms can be mailed to:
Tourism Calgary IAFP Housing
#200, 238-11 Ave. SE
Calgary, Alberta, Canada T2G 0X8

IMPORTANT

Requests for reservations must be received prior to **July 20, 2006** in order to guarantee convention room prices. You must cancel your room prior to July 20, 2006. Cancellations after July 20th will result in a $25.00 USD cancellation fee.

1. Rooms will be assigned in a first-come, first-served basis. Reservations can be made online or by mail or fax.

2. An acknowledgement of your reservation will be sent to you. Please review all information for accuracy. If you have booked online you will be sent an acknowledgement automatically. For all faxed reservations, a confirmation will be sent within 72 hours of reservations being processed; mailed confirmations will take 10-14 days. You may also check your reservation, regardless of how you have booked, by logging onto www.foodprotection.org and selecting the Passkey housing link. You will not receive a separate confirmation from the hotel.

3. Reservations not secured with a credit card, will require a deposit in Canadian funds to be sent directly to the assigned hotel. You will be advised what hotel to make the money order payable to.

4. Reservation modifications & changes can be made online until **August 7, 2006** or be sent in writing to Tourism Calgary prior to the date above. After August 7, 2006, please contact the hotel directly regarding changes or cancellations.

5. All hotel accommodations will be subject to a 4% Alberta Tourism Levy and a 7% Federal Goods and Services Tax (GST). A 1% Destination Marketing Fee may also apply.

6. All room rates are quoted in Canadian funds.

GUEST INFORMATION

For best availability, make your reservation via internet (www.foodprotection.org) or by fax (403) 262-3809.

Arrival Date _____ Departure Date _____

Attention Exhibitors:
NOTE: Change of exhibit hours. Exhibit hall will close at 6:00 PM on Tuesday with teardown immediately following.

❑ Mr. ❑ Ms. ❑ Mrs.

First Name: _____
Last Name: _____
Address: _____
_____
City/State/Province: _____
Zip/Postal Code: _____ Country: _____
Email address: _____
Daytime Ph: ( ) _____ Fax: ( ) _____

HOTEL SELECTION

Please select hotel from list below in order of preference (ie. 1st, 2nd, 3rd choice etc.).

CHOICE	HOTEL	RATES
_____	Calgary Marriott	$174.00 CAD
_____	Fairmont Palliser	$195.00 CAD
_____	Hyatt Regency	$175.00 CAD

All rooms are standard rooms with one or two beds.

# of Occupants in room _____ List Occupants Names: _____

# of Beds Requested _____ _____

(Note: extra charges will apply for more than two people in a room)

Special Room Requirements:

❑ ♿ Disability requiring special services ❑ Non-smoking ❑ Smoking

DEPOSIT INFORMATION

A first night's deposit is mandatory to guarantee rooms. (See instructions & information for other payment options.)

❑ VISA ❑ American Express ❑ Diner's Club ❑ Mastercard

Card Number: _____ Expiry Date: _____

Name on Credit Card: _____

Cardholder's Signature*: _____

**Necessary to process reservations*

Complete and return this form by fax or mail to:
Tourism Calgary - Calgary Convention & Visitors Bureau
200, 238 11 Ave. S.E., Calgary, AB Canada T2G 0X8
Tel: (403) 263-8510 • Fax: (403)262-3809
For more information on Calgary visit:
www.tourismcalgary.com

Tourism CALGARY
CALGARY CONVENTION & VISITORS BUREAU

IAFP 2006 Sponsors

as of April 3, 2006

3M Microbiology

BD Diagnostics

bioMérieux, Inc.

Bio-Rad Laboratories

Cargill, Inc.

Deibel Laboratories, Inc.

DuPont Qualicon

Ecolab, Inc., Food and Beverage Division

F & H Food Equipment Company

Wilbur Feagan

Fisher Scientific

Food Products Association

Food Safety Net Services, Ltd.

IAFP Foundation

International Life Sciences Institute, N.A. (ILSI, N.A.)

International Packaged Ice Association (IPIA)

JohnsonDiversey

Kraft Foods

Nasco International, Inc.

National Alliance for Food Safety and Security

Nelson-Jameson, Inc.

NSF International

Orkin Commercial Services

PepsiCo

Quality Flow Inc.

Springer New York LLC

Strategic Diagnostics Inc.

Texas A&M Agriculture, Department of Animal Science, Food Safety

Weber Scientific

Zep Manufacturing Company

IAFP 2006 Exhibitors

as of April 3, 2006

3-A Sanitary Standards, Inc.
3M Microbiology
Advanced Instruments, Inc.
Aerotech P&K Laboratories
AES – Chemunex, Inc.
American Association for Laboratory Accreditation (A2LA)
American Proficiency Institute
Ameritek USA
AnzenBio, LLC
AOAC International
ASI Food Safety Consultants, Inc.
ATCC
BD Diagnostics
BioControl Systems, Inc.
Biolog, Inc.
bioMérieux, Inc.
Bio-Rad Laboratories
Biotrace International Inc.
Blackwell Publishing
BSI Management Systems
Canadian Federation of Agriculture–Canadian On-Farm Food Safety Working Group (COFFSWG)
Canadian Meat Business
Center for Food Safety and Applied Nutrition, US FDA
Charm Sciences, Inc.
Copan Diagnostics, Inc.
CRC Press - Taylor & Francis Group LLC
Decagon Devices, Inc.
Deibel Laboratories
DSM Food Specialties USA, Inc.
DuPont Qualicon
Ecolab, Inc.
Elisa Systems
EMD Chemicals Inc.
Eurofins Scientific, Inc.
Fisher Scientific
Food Allergy Research and Resource Program, University of Nebraska
Food Quality Magazine
Food Safety Magazine
Food Safety Net Services, Ltd.
FoodHandler
FOSS North America
GOJO Industries
Guelph Food Technology Centre
HiMedia Laboratories Pvt. Ltd
Idaho Technology, Inc.
IEH–Warren Analytical Laboratories
International Association for Food Protection
International Association for Food Protection – Student PDG
International Food Hygiene
International Food Information Council Foundation
Joint Institute for Food Safety and Applied Nutrition (JIFSAN)
MATRIX MicroScience, Inc.
Medallion Laboratories
Med-Ox Diagnostics, Inc.
Meritech, Inc.
Michelson Laboratories, Inc.
Microbial-Vac Systems, Inc.
MicroBioLogics, Inc.
Microbiology International
National Food Safety and Toxicology Center, Michigan State University
Nelson-Jameson, Inc.
Neogen Corporation
Neutec Group, Inc
Nice-Pak Products, Inc.
NSF International
Orkin Commercial Services
Oxoid Canada
Polar-Tech Industries, Inc.
Q Laboratories, Inc.
Quality Assurance & Food Safety Magazine
Quality Flow Inc.
R&F Products
Randox Laboratories Ltd.
R-Biopharm, Inc.
REMEL, Inc.
rtech™ laboratories
Silliker Inc.
Smiths Detection
Society for Applied Microbiology
Springer
The Steritech Group, Inc.
Strategic Diagnostics Inc.
Sword Diagnostics
Thermor Ltd.
TrainCan, Inc.
Warnex Diagnostics Inc.
Weber Scientific

DON'T LET THE BUZZ ABOUT "BIRD FLU" BUG YOU!

You may have heard about "Bird Flu" or Avian Influenza in the news...but is it in our food? No.

The H5N1 highly pathogenic avian influenza strain does not exist today in the United States. One reason is that the U.S. government and poultry industry have safeguards in place to keep it out.

As a food safety advocate, it is important for you to know that there are no reported cases of avian influenza attributed to the consumption of cooked poultry products. Safe cooking of poultry and eggs would inactivate the virus if it were present in poultry meat or eggs. As with other foodborne pathogens (like *Salmonella* and *E.coli O157:H7*) it is important, always, to follow safe handling practices to reduce the risk of foodborne illness caused by bacteria and viruses. Using a food thermometer is the only way to know whether food has reached a high enough internal temperature to destroy foodborne pathogens.

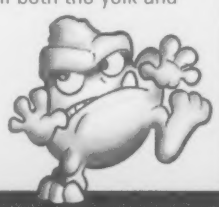
The Partnership reminds consumers to always:

CLEAN: wash hands with warm water and soap for twenty seconds before and after handling food.

SEPARATE: keep raw meat, poultry, seafood and their juices away from other foods.

COOK: cook eggs and poultry products thoroughly and use a food thermometer to measure internal temperature: whole birds, drumsticks, thighs and wings should be cooked to 180°F, breasts to 170°F, ground turkey and ground chicken to 165°F. Cook eggs until both the yolk and the white are firm.

CHILL: refrigerate or freeze meat, poultry, eggs and other perishables as soon as you get them home from the store.



Want to receive E-cards from the Partnership? Sign up to be a BAC Fighter!

BAC Fighters teach that clean, separate, cook and chill are the first line of defense in fighting foodborne illness at home, work and school. Sign up to be a BAC Fighter TODAY and receive important information on food safety education research, tools, events and program developments. Go to the Fight BAC! Web site and click on "Register to be a BAC Fighter!®"

http://www.fightbac.org

Visit ***www.fightbac.org*** TODAY for additional food safety tips.

2006 Partnership for Food Safety Education
Contact Shelley Feist, 202-220-0651

Learn more at:
www.avianinfluenzainfo.org
www.pandemicflu.gov
www.foodsafety.gov

This information was developed by the Partnership for Food Safety Education which unites industry associations, consumer and public health groups and the United States Department of Agriculture, the Environmental Protection Agency and from the Department of Health and Human Services, the Centers for Disease Control and Prevention and the Food and Drug Administration, to educate the public about safe food handling and preparation.

With thanks to Partnership members Egg Safety Center, National Chicken Council, and National Turkey Federation. Printing of this ad made possible by the International Association for Food Protection.

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Zep Manufacturing Company, a leader in food and beverage sanitation, proudly announces a revolutionary breakthrough in chemical sourcing alternatives – **Apex**. The **Apex** line is designed specifically for the discerning buyer who is searching for value-added programs that deliver continuous improvement. Call 1-877-I-BUY-ZEP (1-877-428-9937) then dial 5, 2, and "5173#", or email zepfood@zepmfg.com for a free "value-check" sanitation audit, or contact your local ZepRep for more infomation.

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STUDENT FUNDRAISER!

IAFP 2006
93rd Annual Meeting
August 13-16
Calgary
Alberta Canada

Purchase an IAFP 2006 T-shirt or Polo Shirt from the Student PDG to help raise money in support of our Students. Pre-ordered T-shirts are $20.00 and Polo shirts are $30.00. Shirts will be available for pick-up from the SPDG booth throughout IAFP 2006. All order forms are due by July 1, 2006.

If you choose to pay by credit card, make sure you include the amount to be charged. If you are paying by check, make checks payable to IAFP and enclose the check with your order form. Please mail order forms for receipt by July 1, 2006 for pre-orders.

Please return order form to:

International Association for Food Protection®
6200 Aurora Avenue, Suite 200W
Des Moines, IA 50322-2864, USA
Phone: 800.369.6337 • 515.276.3344
Fax: 515.276.8655
E-mail: info@foodprotection.org
Web site: www.foodprotection.org

IAFP SPDG Shirt Order Form

Name _____ Title _____

Mailing Address _____

City _____ State/Province _____ Country _____ Postal/Zip _____

Telephone _____ Fax _____ E-mail _____

Quantity _____						
	T-shirts	S ❑	M ❑	L ❑	XL ❑	$20.00
	Polo shirts	S ❑	M ❑	L ❑	XL ❑	$30.00

PAYMENT OPTIONS: ❑ VISA ❑ MasterCard ❑

❑ Check or Money Order Enclosed

TOTAL AMOUNT ENCLOSED $ _____
US FUNDS on US BANK

Credit Card # _____

Name on Card _____

Signature _____ Expiration Date _____

Contribute to the Ninth Annual IAFP Foundation Silent Auction Today!

The Foundation of the International Association for Food Protection will hold its Annual Silent Auction during IAFP 2006, the Association's 93rd Annual Meeting in Calgary, Alberta, Canada, August 13–16, 2006. The Foundation supports:

- Student Travel Scholarships
- Ivan Parkin Lecture
- John H. Silliker Lecture (Funded through a contribution from Silliker, Inc.)
- Travel support for exceptional speakers at the Annual Meeting
- Audiovisual Library
- Developing Scientist Competition
- Shipment of *JFP* and *FPT* journals to developing countries through FAO

Support the Foundation by donating an item today. A sample of items donated last year included:

- 3-Month Membership *"Cheese of the Month Club"*
- Mickey Mouse Statue
- PepsiCo Gift Bag
- Assorted Wines
- Cow Parade Figurines
- *Food Microbiology Fundamentals and Frontiers*
- Godiva Chocolate Gift Basket
- Pearl Necklace
- McCormick Spice Rack
- Train Set

Complete the form and send it in today.

Description of Auction Items _____

Estimated Value _____

Name of Donor _____

Company (if relevant) _____

Mailing Address _____

(Please specify: ❒ Home ❒ Work)

City _____ State or Province _____

Postal Code/Zip + 4 _____ Country _____

Telephone # _____ Fax # _____

E-mail _____

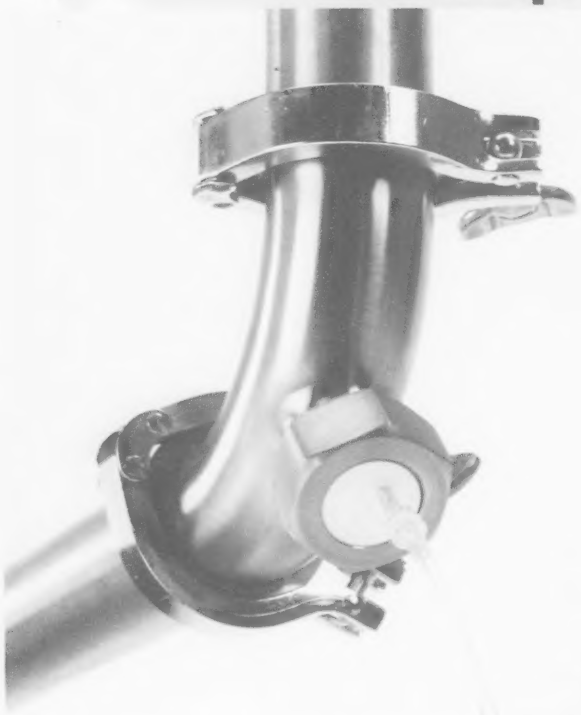
Return to:

Donna Gronstal
International Association for Food Protection
6200 Aurora Avenue, Suite 200W
Des Moines, IA 50322-2864, USA
800.369.6337; 515.276.3344
Fax: 515.276.8655
E-mail: dgronstal@foodprotection.org

International Association for Food Protection®

Today's Dairy Farmers Require Accurate Milk Sampling For Maximum Profits

Staphylococcus aureus



You work hard to run a clean and healthy dairy operation. Get maximum profits for all that effort by using the QMI Line and Tank Sampling System. The benefits are:

- Precise composite sampling to aid in mastitis control
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As you know, your testing is only as good as your sampling.

Escherichia coli

For more information, visit our website at www.qmisystems.com or the University of Minnesota website at http://mastitislab.tripod.com/index.htm

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QMI®

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COMING EVENTS

JUNE

- **5–6, Brazil Association for Food Protection Meeting,** Anfiteatro do Conselho Regional de Quimica. For more information, call Maria Teresa Destro at 55.113.091.2199; E-mail: mtdestro.usp.br.
- **6–8, Penn State Food Microbiology Short Course,** Penn State Berks Campus, Reading, PA. For more information, contact Hassan Gourama at 610.396.6121; E-mail: hxg7@psu.edu.
- **13, Ontario Food Protection Association Meeting,** Springfield Golf Course, Guelph, Ontario, Canada. For more information, contact Gail Seed at 519.463.5674; E-mail: seed@golden.net.
- **15, Basics: Processing Foods Safely,** Guelph Food Technology Centre, Guelph, Ontario, Canada. For more information, call Marlene Inglis at 519.821.1246; E-mail: gftc@gftc.ca.
- **17–21, The Association of Food and Drug Officials (AFDO) 110th Annual Educational Conference,** Crowne Plaza Albany Hotel, Albany, NY. For more information, call Leigh Ann Stambaugh at 717.757.2888; E-mail: lstambaugh@afdo.org.
- **22–23, Doing It Right: Winning at New Products in the Food Industry,** Guelph Food Technology Centre, Guelph, Ontario, Canada. For more information, call Marlene Inglis at 519.821.1246; E-mail: gftc@gftc.ca.
- **24–28, IFT Annual Meeting,** Orange County Convention Center, Orlando, FL. For more information, contact James Klapthor at 312.782.8424 ext. 231; E-mail: jnklapthor@ift.org.
- **26–28, New Zealand Association for Food Protection Meeting,** Sky City Convention Centre, Auckland, New Zealand. For more information, contact Roger Cook at 64.4.463.2523; E-mail: roger.cook@nzfsa.govt.nz.

JULY

- **3–6, SFAM Summer Conference —"Living Together" Polymicrobial Communities,** Apex International Hotel, Edinburgh, United Kingdom. For more information, E-mail: meetings@sfam.org.uk; or go to www.sfam.org.uk.
- **10–11, Certified HACCP Auditor (ASQ),** Guelph Food Technology Centre, Guelph, Ontario, Canada. For more information, call Marlene Inglis at 519.821.1246; E-mail: gftc@gftc.ca.
- **10–13, Better Process Control Schools,** Louisiana State University, Baton Rouge, LA. For more information, call Dr. Michael Moody at 225.578.5207; Fax: 225.578.5300.
- **14–21, XXVI International Workshop/Symposium on Rapid Methods and Automation in Microbiology,** Manhattan, KS. For more information, contact Daniel Y.C. Fung at 785.532.1208; E-mail: dfung@ksu.edu.
- **16–19, 43rd Annual Florida Pesticide Residue Workshop,** Hilton Walt Disney World, Orlando, FL. Submission for oral presentations is May 15 and posters is June 1. For more information, contact Gail Parker at 850.410.3057; E-mail: parkerg@doacs.state.fl.us.
- **16–19, 8th Annual Foodborne Pathogen Analysis Conference,** Hilton Walt Disney World, Orlando, FL. Submission deadline is June 8th. For more information, contact Yvonne Hale at 850.414.0408; E-mail: haley@doacs. state.fl.us.
- **18, United Kingdom Association for Food Protection Second Annual Meeting,** J Sainsbury Place, London. For more information, contact Gordon Hayburn at 02920.416456; E-mail: ghayburn@uwic.ac.uk.
- **24–26, Microbiology and Engineering of Sterilization Processes,** University of Minnesota, St. Paul, MN. For more information, contact Ann Rath at 612.626.1278.

AUGUST

- **11–12, IAFP 2006 Workshops,** Calgary, Alberta, Canada.
  Workshop 1: *Developing and Improving Your Food Microbiology Laboratory*
  Workshop 2: *Methods, Methods Everywhere but Which is Right for Me? Selection and Verification of Methods*
  Workshop 3: *Global Food Standards: Food Safety Auditing*
  For more information, see page 346 of this issue or contact Julie Cattanach at 800.369.6337 or E-mail: jcattanach@foodprotection.org.
- **13–16, IAFP 2006 Annual Meeting,** Calgary, Alberta, Canada. For more information, contact Julie Cattanach at 800.369.6337 or E-mail: jcattanach@foodprotection.org.

SEPTEMBER

- **5–9, China Brew & Beverage 2006,** China International Exhibition Centre, Beijing, China. For more information, call 852.2865.2633; E-mail: elaine@bitf.com.hk.
- **19–21, New York State Association for Food Protection Annual Meeting,** Wyndham Hotel, Syracuse, NY. For more information, contact Steve Murphy at 607.255.2893; E-mail: scm4@cornell.edu.
- **19–21, 3rd International Symposium Milk Genomics & Human Health,** Brussels, Belgium. For more information, contact Jennifer Giambroni at 322.733.9888; E-mail: info@cdrf.org.

OCTOBER

- **14–17, 26th Food Microbiology Symposium,** University of Wisconsin-River Falls, River Falls, WI. For more information, call 715.425.3704 or go to www.uwrf.edu/food-science.
- **18–19, Iowa Association for Food Protection Annual Meeting,** Quality Inn, Ames, IA. For more information, contact Phyllis Borer at 712.754.2511 ext. 33; E-mail: borerp@ampi.com.

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AUGUST 13-16, 2006
Calgary, Alberta, Canada

JULY 8-11, 2007
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(a) a university degree and higher qualification(s) in Food Science / Food Technology / Nutritional Science / Dietetics /Food Toxicology / Food Microbiology / Food Biotechnology, or related subjects from a Hong Kong University, or equivalent;

(b) at least 10 years' relevant post-graduate experience in food safety and related field, including designing and conducting total diet studies and exposure assessment; 5 years of which should be in a position with supervisory responsibilities; and

(c) have Grade E or above in English Language (Syllabus B) in the Hong Kong Certificate of Education Examination, or equivalent;

(Note: Preference will be given to candidates with a Master of Public Health or related discipline with training in Epidemiology and Biostatistics at a post-graduate level and Chinese language proficiency.)

Duties: Lead a team with scientific and research staff to plan, organize and conduct risk assessment studies, including total diet studies, nutritional risk assessment studies, studies on food consumption and dietary habits; and maintain related database; develop a computerized exposure assessment system; provide technical advice for formulating policies and measures relating to food safety and nutrition; develop, review and recommend food safety standards, codes of practice, quality control guidelines and legislation relating to food control; and enhance liaison with international and national food authorities, other government departments and food industry on subjects under his/her purview.

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Gratuity: A gratuity up to about HK$254,766/about US$3,660 may be granted upon satisfactory completion of the contract with consistently high standard of performance and conduct. The amount of gratuity will be the sum which, when added together with the Government's contribution to the Mandatory Provident Fund Scheme, equals to 150% of the total basic salary drawn during the contract period. (Note: At current rates, salaries tax does not exceed 16% of gross income.)

Fringe Benefits: In addition to rest days, statutory holidays (or substituted holidays), maternity leave and, sickness allowance, granted in accordance with the provisions in the Employment Ordinance, 14 days paid annual leave will be granted under a continuous contract of employment for every 12 months.

How to Apply: Interested parties can visit the website of the Food and Environmental Hygiene Department at http://www.fehd.gov.hk. Application forms (**G.F.340 (Rev. 1/2004)**) can be downloaded from the Civil Service Bureau's Internet web site (http://www.csb.gov.hk). Completed application forms together with copies of the relevant supporting documents should reach the following address **on or before 31 May 2006** with the envelope clearly marked "Application for the job of Food Safety Officer." On-line application can also be made through the Civil Service Bureau's website at http://www.csb.gov.hk. Candidates who are selected for interview will normally receive an invitation in about six weeks from the closing date for application. Those who are not invited for interview may assume that their applications are unsuccessful.

Address and Enquiry Tel.: Executive Officer (Appointments) 3, Appointments Section, Food and Environmental Hygiene Department, 44/F., Queensway Government Offices, 66 Queensway, Hong Kong (Fax: (852) 2869 0015). For enquiries, please call (852) 2867 5079 or e-mail to ssmchung@fehd.gov.hk.

Closing Date for Application: 31 May 2006

General Notes:

(a) Non-civil service vacancies are not posts on the civil service establishment. Candidates appointed are not on civil service terms of appointment and conditions of service. Candidates appointed are not civil servants and will not be eligible for posting, promotion or transfer to any posts in the Civil Service.

(b) The terms of appointment and conditions of service to be offered are subject to the provisions prevailing at the time the offer of appointment is made.

(c) Holders of academic qualifications other than those obtained from Hong Kong institutions/Hong Kong Examinations and Assessment Authority may also apply but their qualifications will be subject to assessments on equivalence with the required entry qualifications. They should submit copies of their official transcripts and certificates by mail to the above enquiry address, by fax to (852) 2869-0015 or by e-mail to ssmchung@fehd.gov.hk.

(d) It is Government policy to place people with a disability in appropriate jobs wherever possible. If a disabled candidate meets the entry requirements, he/she will be invited to attend the selection interview/written examinations without being subject to any further shortlisting criteria.

(e) Non-civil service vacancies information contained in this column is also available on the following Internet web sites: http:/www.info.gov.hk of the HKSAR Government Information Centre and http://www.fehd.gov.hk of the Food and Environmental Hygiene Department.

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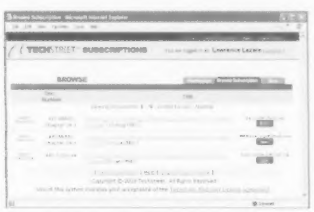

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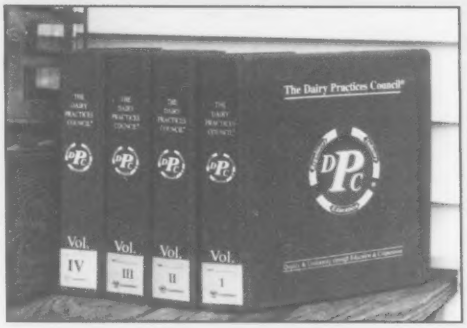

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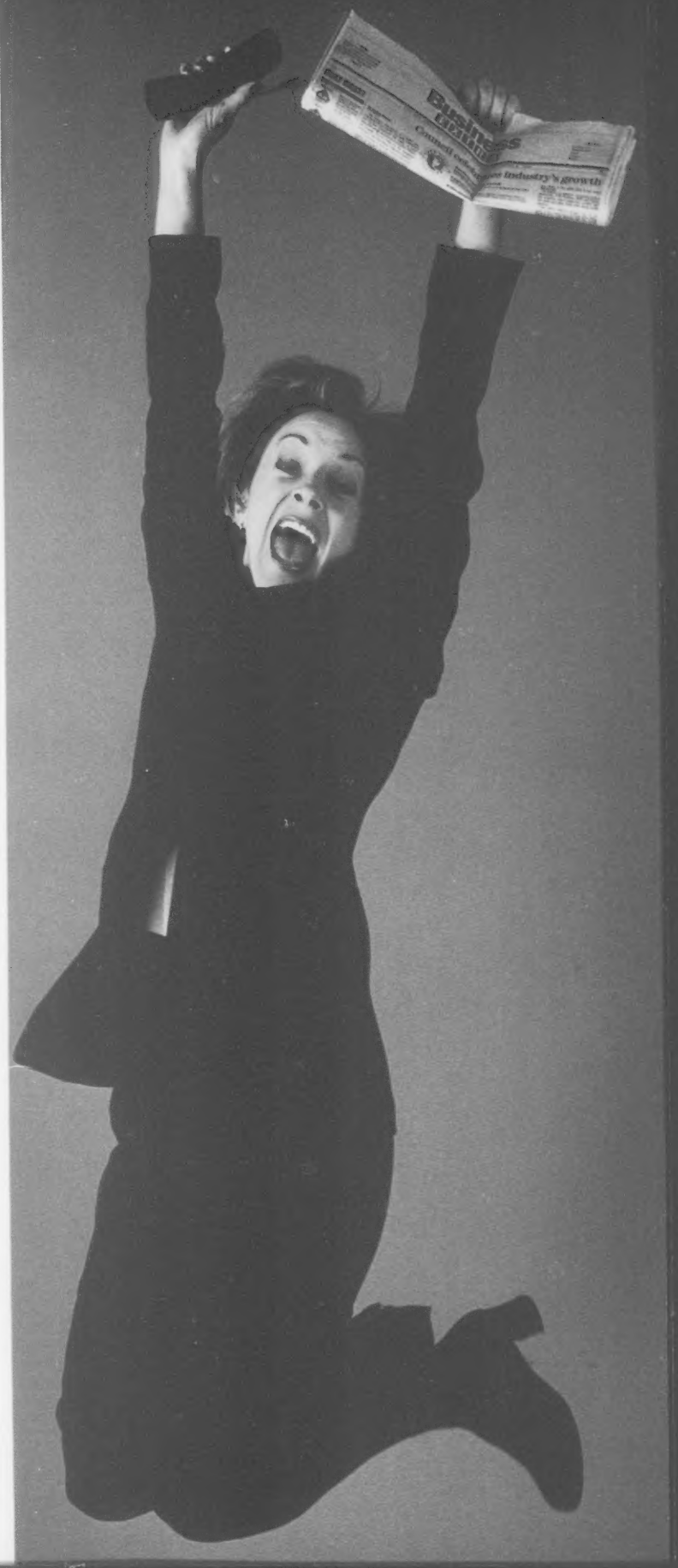

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